# POPULAIR SCIBICIS

Smart shopper's guide to

AUGUST . 350 Monthly

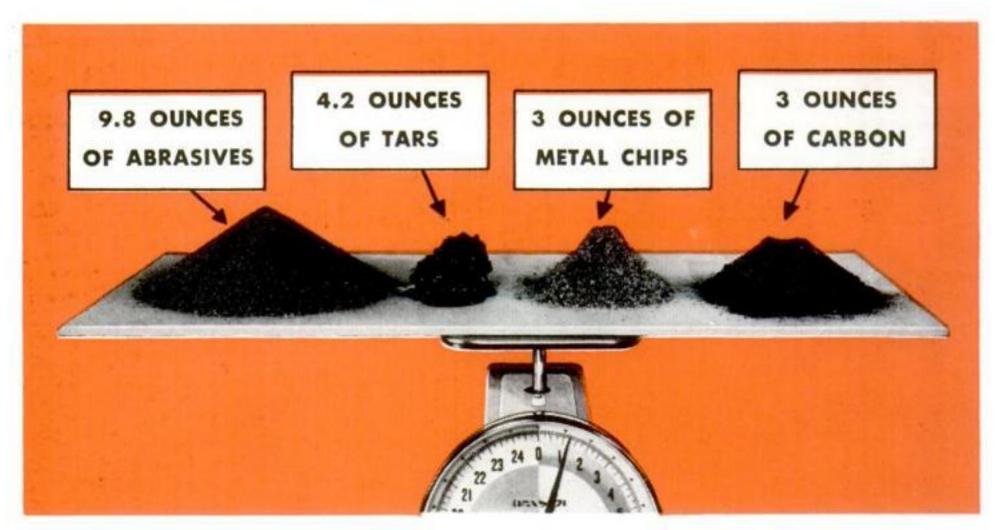
New Portable Radios

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OLARADIO

plus: "What Makes Cars
Cost So Much?"

Constituted materi



### trap over a pound of these enginekillers every 10,000 miles!

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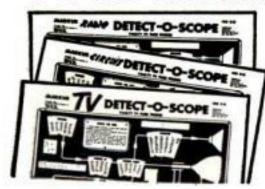
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### Popular Science Monthly

### August, 1957

Cover photograph by O. W. Link



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Whirling at 150,000 r.p.m., this new drill cuts with no vibration, almost no pain

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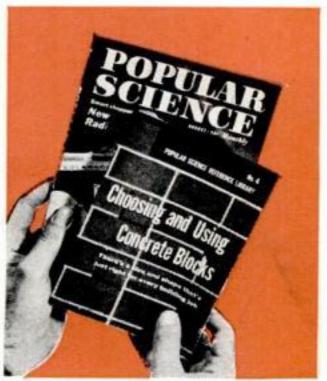
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EDITORIAL OFFICES: 353 Fourth Ave., New York 10, N.Y.

Publisher RALPH H. FLYNN

Advertising Manager LEE P. ADAMS

Circulation Director EUGENE WATSON

### ADVERTISING OFFICES:

NEW YORK-353 Fourth Ave. CHICAGO-360 North Michigan Ave. DETROIT-820 Book Bldg. SAN FRANCISCO-114 Sansome St. CLEVELAND-636 B. F. Keith Bldg. LOS ANGELES-1127 Wilshire Blvd. PORTLAND, ORE.-520 S.W. Sixth Ave.

#### SUBSCRIPTION SERVICE:

Address all subscriptions and correspondence concerning them to: Subscription Department, 353 Fourth Ave., New York 10, N. Y. Allow four weeks' notice for change of address. Please give both old and new addresses, including zone numbers.

Published monthly at 353 Fourth Avenue, New York 10, N. Y., by Popular Science Publishing Co., Inc., Godfrey Hammond, Chairman of the Board; Ralph H. Flynn, President and Treasurer: Franklin Parker Jr., Secretary; Eugene Watson, Vice-President. Second-class mail privileges authorized at New York, N. Y., and Dayton, Ohio. Entered as second-class matter at the Post Office Department, Canada. Printed in U.S.A. Copyright, 1957, by Popular Science Publishing Co., Inc. All rights reserved in the United States, Great Britain, and in all the countries participating in the International Copyright Convention and Pan-American Copyright Convention. Single copy 35¢. Subscriptions to United States, its possessions, and Canada, 1 year \$3.40 (2 years \$6.00, 3 years \$8.00). Elsewhere. 1 year \$6.00 (2 years \$11.00, 3 years \$16.00).

AUGUST 1957 3

### SKIPPED ME AGAIN!

POOR BURT! HE MISSED OUT ON THAT PROMOTION AGAIN!



I WAS DETERMINED TO MAKE GOOD IN MY JOB...BUT DETERMINATION, I FOUND, WAS NOT ENOUGH!

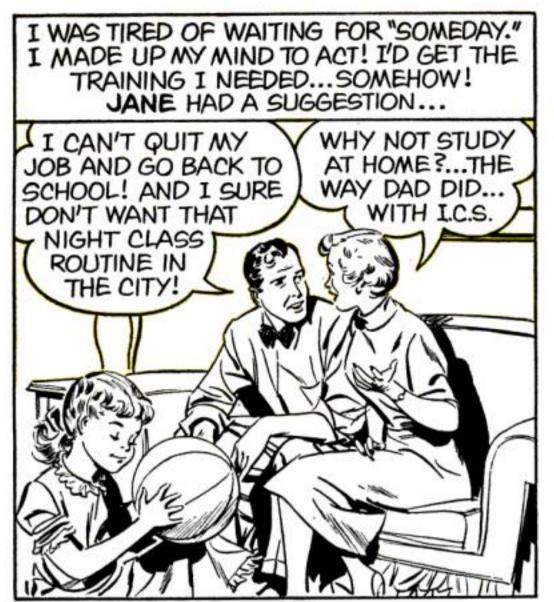
I HAD PLENTY OF EXPERIENCE.
AND THE BOSS SEEMED TO LIKE
ME. I LACKED JUST ONE THINGTRAINING!

SORRY, BURT! I KNOW
YOU'VE WORKED HERE
LONGER. BUT TED HAS
THE SPECIAL TRAINING
WE NEED. YOUR
CHANCE WILL COME
....SOMEDAY!

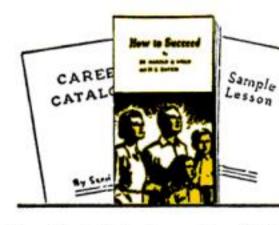
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### PS Readers

### TALK BACK

#### **Cheers for Car-Care Articles**

Hooray for your article on how to take care of a '57 Ford [June]. With autorepair and maintenance costs mounting daily—every mechanic wants to be in the



90-percent income-tax bracket, apparently—car owners have no choice but to become do-it-yourselfers.

J. Bevin, W. Hempstead, N. Y.

A similar article on the '57 Chevy appeared in the July issue, and an article on the '57 Plymouth is in this issue, page 181.

#### Police Cars Can Talk to Each Other

Your May article, "Why You Can't Outrun the Police," states that while chasing a speeder one patrol car radioed to the patrol car ahead. But highway patrol-car radios are not three-way; they are mobile-to-base and vice versa. The FCC has the Michigan State Police listed as 42.74 MC for the base station at Lansing, and the mobile units listed as 42.58 MC. Therefore, it would appear that this article must be in error as the patrol car in the rear would have to radio the base station to relay the message to the patrol car ahead—unless by some odd chance they have two receivers in patrol cars in Michigan, which doesn't seem likely.

> Donald V. Doyle, Iowa House of Representatives, Des Moines

Cpl. Perry, one of the persons in the chase referred to by Mr. Doyle, answers:

THE information in May POPULAR SCIENCE is correct. We have a car-to-station frequency, and a car-to-car fre-

quency with which we can transmit from our cars. On the night in question we were on the car-to-car—a flip of a toggle switch does this, although the radios are of the fixed-frequency type. Of course, the station can receive both bands.

If they do not have the above-mentioned system in the Representative's state I would respectfully urge that he look into it. It saves much time and radio traffic. I may be wrong, but I believe a good many police radio systems are set up this way.

CPL. GLEN C. PERRY, New Buffalo Detachment, Michigan State Police

#### He Wants a Tethered Plane

COULD someone help me solve this mechanical problem: how to make an "earthbound" airplane?

It is to be an attraction for a cafe and snack bar at a summer resort. I have thought about something between a Link trainer and one of those flying gondolas seen at some amusement parks.

However, I want to have as much "flying feel" as possible—cockpit with stick
and an ordinary light airplane engine
with propeller. The whole thing would
be supported from a high pole with a long
steel boom between so that it will rotate
in wide circles and be able to rise and



dive and eventually do some side movements. The engine would give forward movement the usual way, via the propeller, and could also drive a hydraulic pump to raise the boom and tilt the plane.

Vic B. Nilsson, Hammarby, Sweden

#### Reader Informs Writer

Being a bit more informed and perhaps not so prejudiced as the writer of the

6 POPULAR SCIENCE

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THE BALANCE SHEET

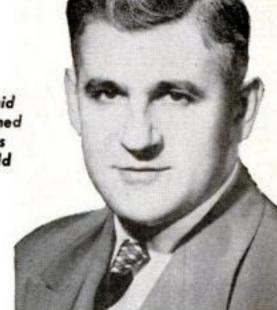
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D. NEW! Double Head 12-Point 15° Box Wrench. Meets Mil. Spec. Designed for use on elastic stop nuts. Openings, 1/6" x 11/32". Length, 51/4". Satin chrome plated.



article on foreign economy cars [June] I am prompted to point out certain statements that are contrary to fact regarding the Karmann-Ghia Volkswagen.

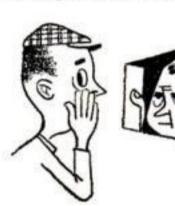
 The Karmann Ghia has two deeply upholstered bucket-type front seats and a small bench-type jump seat in the rear which can accommodate two additional

passengers.

2. On page 61, is the writer discussing the Ghia or the Volkswagen? The impression one gets is that the Ghia has "a cam that helps hold top speed under 70 m.p.h." My Ghia has consistently been driven over flat, level roads in excess of 75 m.p.h.

The impression is also left with the reader that the Ghia is the "biggest seller by far of all the little foreign cars over

here." If the Ghia is the "biggest seller" why do you say that to get the "Ghia version you have to knock and whisper that Joe sent you?" I walked in the showroom and bought my



car one noon while on the way home. W. G. TIMMONS, Dallas, Tex.

Answers author Devon Francis: (1) Only way Ghia can carry four is if two are midgets. (2) 75 m.p.h. on the speed-ometer—or actual speed? (3) The standard VW is the biggest seller, not the Ghia model. Ghias are in short supply in many places in the U.S.

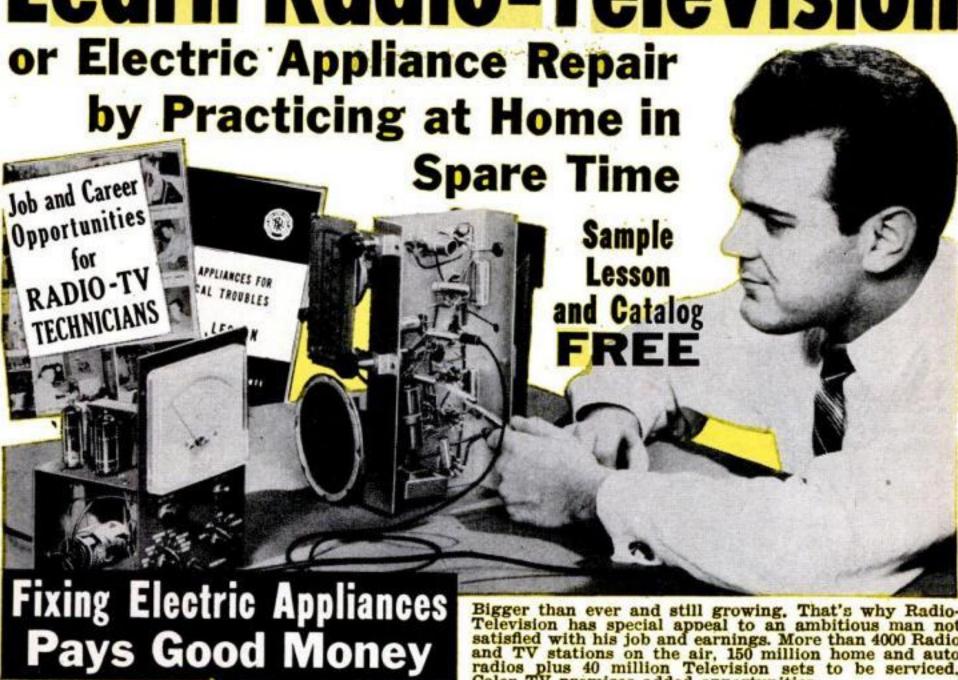
#### PS Story Answers His D-Day "Whys"

Your June story, "History's Most Fateful Weather Forecast," carried me back to 1944. It also clarifies portions of an event I lived through.

At the time your story begins—eight a.m., June 1, 1944—I was a Signalman 3/C in the U.S. Navy. We had been in the British Isles for almost six months. At Gravesend, just outside of London, we had met LCT (A) 2043. Navy-fashion, we griped. Why must we get this old model LCT? Why did the British outfit it? Why the armor plate? Why the heavy timber platform up forward on the open deck?

We had a night of terror running past the German "E" boats, down the English Channel to Dartmouth. When I say run-

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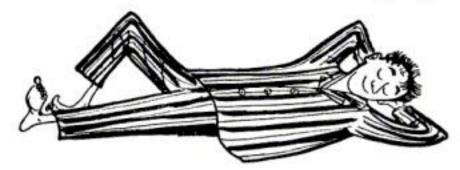
For the trained man there are good jobs, a bright future in Radio-TV Servicing or Broadcasting. Soon after enrolling, many NRI students start to earn cash fixing neighbors' sets in spare time. Some pay for their training and enjoy extra luxuries this way. Some make enough to start their own full time Radio-TV shops.

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million cars and trucks are on the road, and all require maintenance. At least one-third are in the heavy-repair class. There's so much work that 50,000 mechanics are needed! It's easy to learn this trade at home. Find out how by mailing coupon below.

EARN MONEY IN SPARE TIME as you train. Many students repair cars for neighbors; others get jobs in local garages; some open shops by the time they graduate. You can learn-and-earn because CTI offers practical Shop-System training.

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Send your new Auto Mechanics book and Sample Lesson, BOTH FREE,	Big Mosey To
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ning, I mean at our top speed of about five knots. The last week of May, at Weymouth, we joined hundreds of ships, all outfitted and manned. We received our cargo—three Sherman tanks, one with a bulldozer blade and a trailer loaded with explosives—and our troops, "demolition men."

This is where your D-Day story begins. It must have been about June 1. Now we sweated out the big questions: when and where? We had no idea then that the top brass, grouped there in the War Room at Allied Naval Headquarters at Portsmouth, only knew where, not when. By June 2, we were getting uneasy; by June 3 downright touchy. What were we waiting for? Any fool could tell we were getting ready to hit Europe. The Germans would surely know we were coming. They'd be ready.

Then, early in the morning of June 5, we left the harbor. They're crazy, we thought. It was raining hard, high winds, rough water. Our small flat-bottomed craft had a rough time. We weren't made for rough open water. What was the matter with those clowns running this show? We turned back. Radio had changed the orders.

Now, Eliot Tozer's article tells me why: weather. After returning to the harbor we were sure it was off. Instead, we started out again. The weather was still bad. And the English Channel can



be the roughest body of water in the world. We tossed about and shipped water badly. The men weren't feeling well; equipment broke loose.

We hit Omaha Beach at H-Hour on D-Day. I guess we did our job. I'm still not sure what it was, except to get those three Shermans on the beach. The one with the dozer blade could clear some of the obstacles. And the trailer of explosives was for the demolition men. The surf swamped the first tank down the ramp. The crew was gunned as they

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crawled out of the hatch. The second tank made it. We found it later—burned. The Sherman with the dozer blade and trailer had hardly reached the wooden ramp when a shell blew the right track off. Our right side had 11 holes left by the Nazi 88s; we lost two of our three engines. Our ramp was down and jammed, so we actually had no bow. We severed the cables to free our ship.

As we backed off, listing badly, we didn't expect we could help anybody else. But somehow we managed a line to another LCT that was without engines—and a sitting duck for the shore guns. With God's help we did save her. Between then and our finish, we were a wandering derelict.

About a week later we managed to tie up to an LST repair ship. They plugged our holes, cut away the broken steel and removed the engines. It was the 19th of June when a storm hit us hard. The LST had to swing the ax and cut our lines to save themselves; we would have hammered them to bits in the high seas. Our crippled ship was driven onto Omaha Beach. That was the "unique and unpredictable" northeaster described in your story. And that was the end of LCT (A) 2043.

Bernie Oram St. Petersburg, Fla.

### Disapproves But Won't Drop PS

I HEARTILY approve of the sentiments expressed by your correspondent from Nottingham, England [PS Readers Talk Back, May] to the effect that you stop glamorizing war and death-dealing bombers. There is nothing glamorous about war. However, I do not intend to follow his example by canceling my subscription.

JOSEPH SPENCER, New York City

#### More Hidden Keys

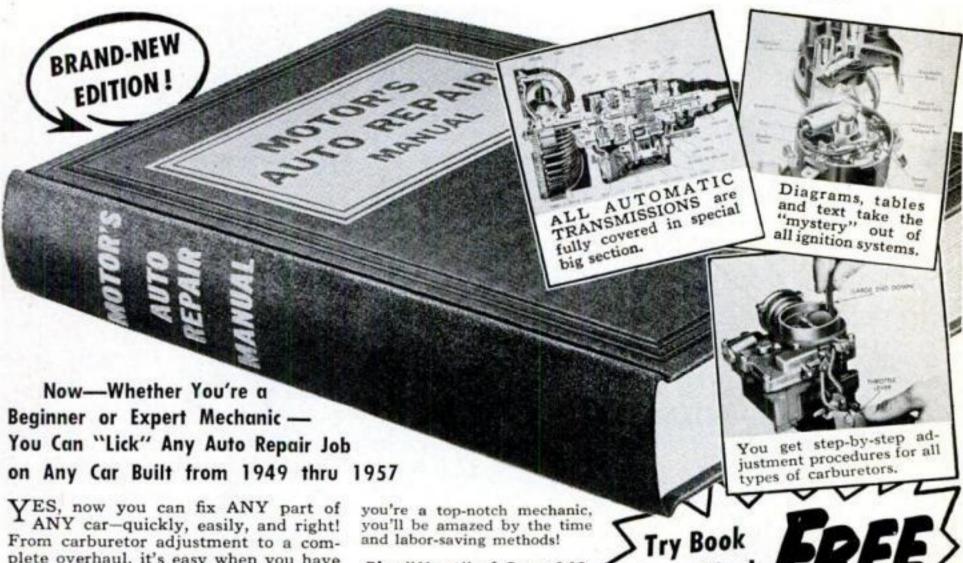
IN YOUR "Hints from the Model Garage" [May] my wife thinks that in case you lost your car keys, you would have to climb under the car and reach up to the bag to get that spare set under the hood. I insist that we should keep still a third set in the trunk, so that we could then open up the car and get at the spare keys under the hood. Our hood releases from inside the car.

C. THOMAS DINSER, Rossmoyne, Ohio

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—P. Pemper, Wisc.





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—V. Lauria, Nev.

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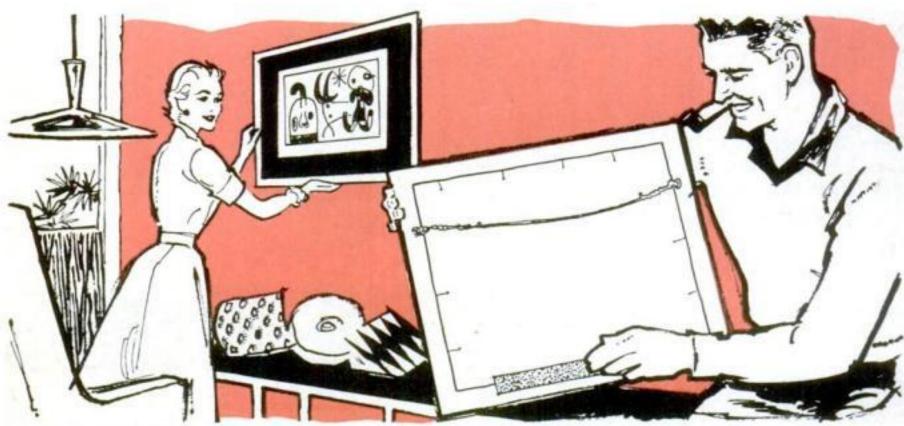
### Keeping the Home Shipshape



A PUP WILL DINE CALMLY if his food and water are put down on a car mat. The grooved rubber surface will keep the dish from skidding forward and frustrating a too-eager Fido.

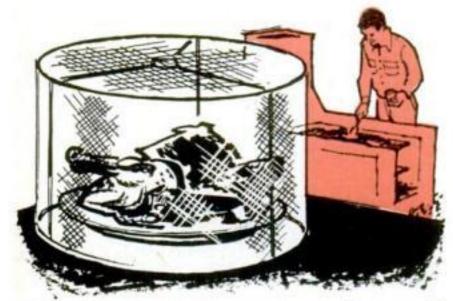


IF WINDOW SHADES TURN YELLOW from the sun while still in good condition, you can brighten them up by covering them with ready-pasted wallpaper or decorative stick-down plastic.



frames hang straight on the wall, paste a strip of sandpaper about 3" long by ½" wide on the back along the lower edge. The abrasive ad-

heres to the wall, keeping the frame from sliding with every vibration. To shift-proof small pictures, put a rubber-headed tack in the lower corners of the frame to provide friction.



MAKE A FOOD PROTECTOR for outdoor meals by covering a lampshade frame with window screening. Cut the screening to fit and lace it together at the joints with plastic cord.



A BUILT-IN IRONING BOARD that is never used takes up space that could be put to a good use. Remove the board, paint or paper the wall at the rear and put in shelves to hold small items.

4 POPULAR SCIENCE

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REFRIGERATION

It has been one of America's great industries for years-but the way it's growing, you'd think it was in its infancy! That's why the air conditioning and refrigeration industry appeals so strongly to ambitious men who want better jobs, more security, higher pay.

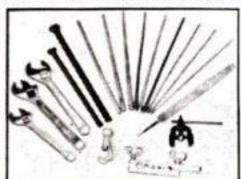
Over 150 million refrigerating units are in use today-are in need of repair and service. Each year, 3 million refrigerators, 1 million freezers and 2 million air conditioners are produced. Not only homes, but stores, offices, restaurants, motels and transportation systems use some form of refrigeration. Even autos are being made with air conditioners. No wonder trained men are in big demand-are so well paid! Want to be a mechanic in this field? To find out how, just mail coupon for valuable free information!

### AN AMAZING, NEW SHOP-METHOD TRAINING PLAN

After years of research, CTI has developed a wonderfully effective training plan. It enables you to train at home in spare time. You get 23 big kits to build an air conditioner, refrigerator, freezer or milk cooler. You keep all this equipment. You do 10 service and trouble-shooting jobs. CTI brings field training right into your home! You get practical experience as you learn.

### YOU GET EXPERIENCE AS YOU TRAIN BECAUSE YOU PRACTICE WITH COMMERCIAL EQUIPMENT

You get all parts and tools to build a heavy-duty, commercial-type, 1/4 h.p. refrigeration high-side (illustrated at right.) You receive lesson material which not only makes kit assembly easy, but downright fascinating! Remember, kit training in this field is a CTI "FIRST"





Above left is photo of special tools in just one kit. In another kit (right) you get motor, fan, pulley, service tools. You get other tools, tubing, much equipment, all of finest quality. Kits are sent on a planned schedule so that you learn in easy stages. Kit training de velops skill, provides experience, speeds training.

### HOW YOU MAY EARN CASH AS YOU TRAIN Many students do repairing in their spare time soon after they enroll. A number get part-time jobs, others open

shops. With their earnings many students not only pay their tuition, but sometimes have enough money remaining to put in the bank. The reason that students can do field work for profit is that CTI training is practical. Students get their experience as they train-not as lowpaid apprentices! But get the complete story on your opportunities. Fill out and mail coupon today.



The air conditioning and refrigeration industry is a good one in which to start out "on your own." Many CTI graduates have done it, and if you have the determination, you could do it, too! CTI has special information for men who want to go into business. Mail coupon for details.

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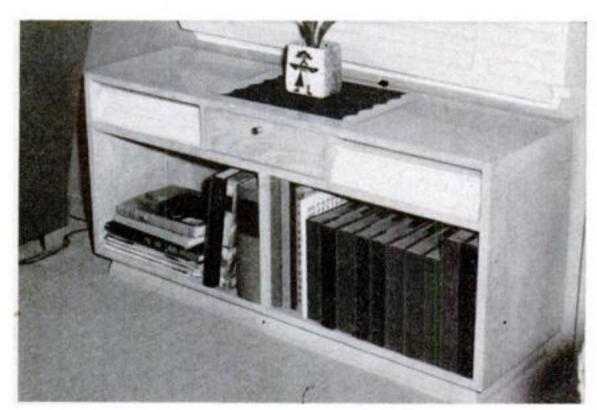
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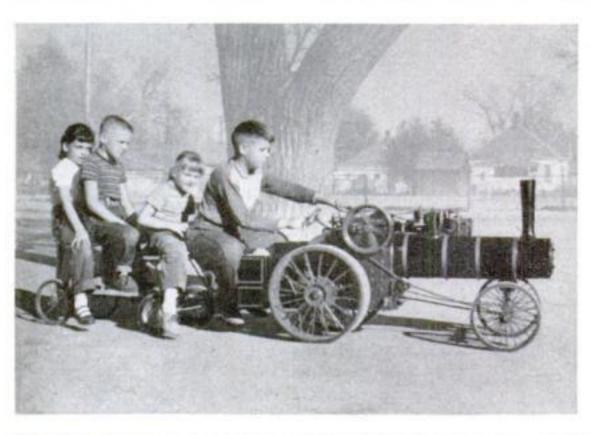
MILK COOLER

### Prize Projects BY PS READERS









**Sky Sweeper.** Harold E. Emery of Philadelphia ground the mirror for this eight-inch telescope through which he took the moon photograph at far left.

Wet newspapers on a barrel top served to hold the tool, a glass disk dusted with grinding compound. Rubbing the mirror face on this, he trudged around the barrel for three months of spare time; then sent out the mirror for a reflective coating of aluminum.

His total cost: \$46. Mirror value alone: \$100.

Planned Storage. When Norman L. Chalfin of Culver City, Calif., built this cabinet of oriental ash, he had all his hobbies well in mind. Two dozen 12" record albums or 400 LP platters find a home in its four-foot length. The drawer holds eight-mm. movie reels and the niches at either side accommodate art folios.

steam Spouter. This model of an early farm tractor makes George Glusick's son, Alvin, a popular boy in Pueblo, Colo. Glusick went back to the turn of the century for the specifications. All the parts except the big castings were cut from mild steel and welded and machined to shape. Fired up with fine coal, the steam engine works on an operating pressure of 100 pounds to the square inch.

Have you recently completed a workshop project of which you are particularly proud? Send a good photograph of your work, along with a negative and a brief description,

to the Mechanics and Handicraft Editor, Popular Science, 353 Fourth Ave., New York 10, N. Y. We will pay \$15 for each item that is accepted for publication.

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Wm. Reichers, New York

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W. K. Andersen, Wisc.



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R. Eisenbart, Wisc.

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AUTO-AID STREET SIGNS that also list the street ahead. They would minimize braking at every corner to find a turnoff, or sudden stops for left turns.—B. Middleton, Muncie, Ind.



PRE-MEASURED ROLL ROOFING with dots marked on one side at each foot. It would save a lot of measuring when cutting off lengths for application.—Robert F. Ricks, Richmond, Va.



vitamin Pills in Strips of seven, or in pockets on a calendar so that Mom could see at a glance if Junior (or Dad) is taking his daily quota.

—H. E. McCready, Allentown, Pa.

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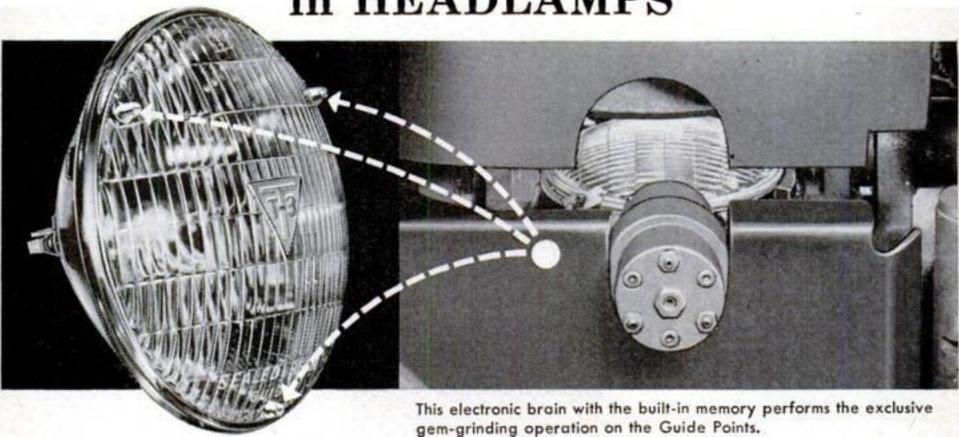
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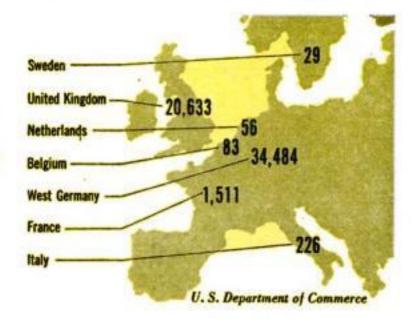
20 POPULAR SCIENCE

### You ought to know...

THE STREET STREET

Detroit has stopped laughing at the little cars. Even Big Brother GM now admits that at least some U.S. motorists want economical transportation. It will import and sell here two cars made by its European subsidiaries. Buick dealers will sell the German Opel Rekord, Pontiac dealers the British Vauxhall (rhymes with "talks all") Victor. The GM move adds weight to the opinion of some experts that some U.S. buyers are rebelling against the high price of Detroit's "insolent chariots." (For the inside story of why American cars cost what they do, see page 65.) Skyrocketing sales of foreign cars also support this theory. This year the total, while still only a drop in Detroit's big bucket, will be four times what it was in 1955 (see chart at left, which shows

Where the Foreign Cars Come From



the latest complete figures). Practically all of these are the cheap-to-buy, cheap-to-run VWs, British Fords, Renaults . . . Look for air-inflated seat cushions in cars, though perhaps not in 1958. One maker is testing them already. They'll make

an air compressor, also needed for air suspension of the car itself, a critical engine accessory.

Don't pay any attention to "list price" when you shop for home machinery. Popular Science has been warning you about this gimmick in its how-to-buy articles—there's a report on portable radios in this issue, page 84—and the National Better Business Bureau has now added its authoritative voice with a blast against "the unconscionable comparative price and pre-ticketing policies of some of the nation's largest manufacturers . . ." NBBB investigators turned up one outrageous example: a power lawn mower packed in a carton that was marked "Suggested Retail \$154.95." The wholesale price of this machine was \$50. A Boston department store was selling it, reasonably but profitably, for \$66, while advertising the phony "list" price. Some bargain!

A pill to protect people against atomic rays is now closer to reality. Quite a few chemicals work well in animals. One in particular, called AET, is 100 percent effective on mice—a treated mouse can live through an X-ray exposure that would kill an untreated mouse (X rays are essentially the same as the gamma rays from A and H bombs). Drs. B. G. Crouch and R. R. Overman of the

AUGUST 1957 2

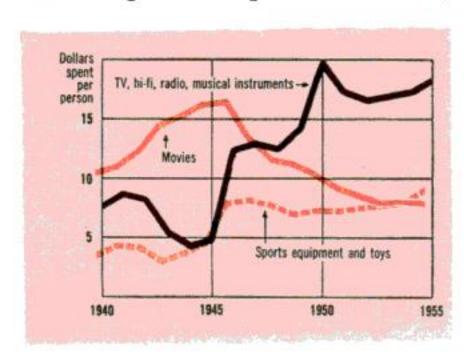
### You ought to know...

University of Tennessee have tried AET on a few monkeys, with equal success—every one of them survived an ordinarily fatal dose of X rays.

Will it work on humans? The first step is to find out how much AET people can safely take, since the chemical is itself poisonous (if taken in large quantities). This is now being done. The next step—measuring the protective effect—is a lot harder; you can't purposely expose human beings to lethal radiation, at least not for test purposes. The plan is to try AET if someone must risk his life anyway, perhaps by entering a highly radioactive area. Blood tests would then show how much radiation damage the chemical had prevented.

Money you spend on TV and hi-fi comes back to you as money you don't spend on movie tickets. Department of Commerce figures show:

Movie expenditures plummeted from \$17 per person in 1946 to



\$8 in 1955, while expenditures for home electronic entertainment shot from \$12 per person in 1946 to \$18 in 1955. (The chart at left cancels out inflation by giving all figures in "1955 dollars.") This is only part of the average American's 1955 bill for recreation: \$200. Among

the other items: \$3 lost betting on races, \$1 for opera and legitimate theater, \$3 on books and maps, \$9 for foreign travel.

Will the artificial moon rise early? Don't be surprised if they hang one of those artificial satellites out in space much sooner than the official timetable specifies (that's spring, 1958). The rocket engines and the silvery spheres are on hand, as are some instruments for following them after they are launched. The main tracking stations, particularly the complex Schmidt cameras that will reveal if the ball is really there, aren't nearly ready yet. But U.S. scientists are much more sensitive about Russian competition than they like to admit. And they're worried lest the Reds score an honest (not Pravda-style) first in the big satellite race. So the U.S. will fire a number of full-scale test shots, informally but not secretly. If one of these tests succeeds in placing a satellite in an orbit around the earth, the feat will be announced, very loudly. The talk is that it could happen any week now, perhaps even by the time you read this.

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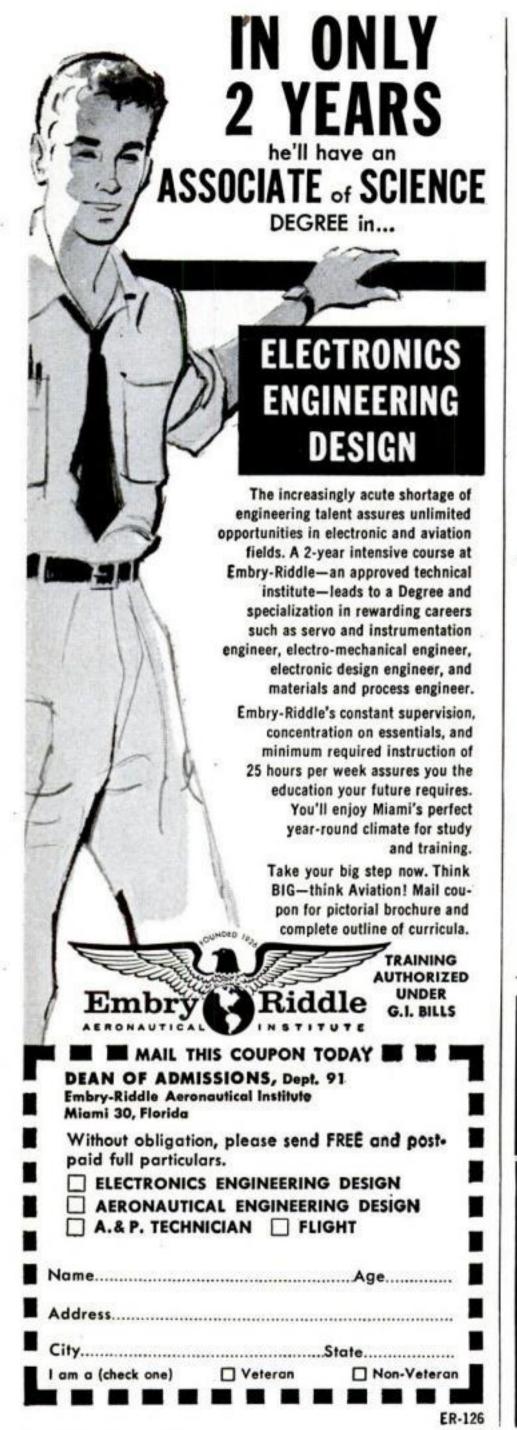
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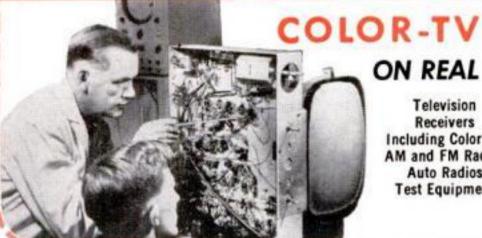
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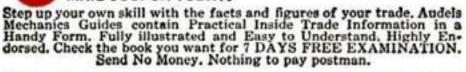
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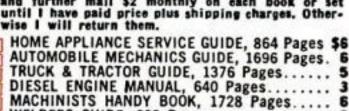
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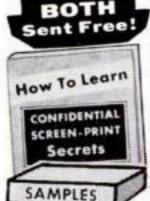
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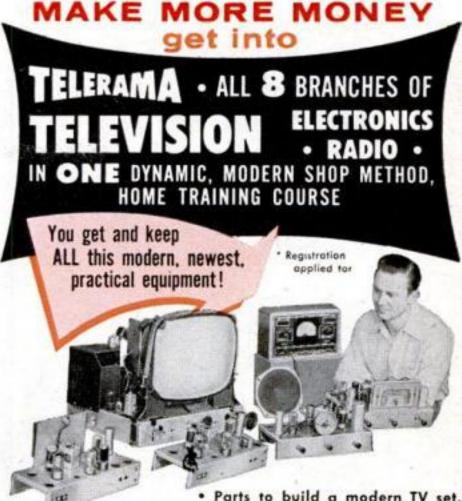
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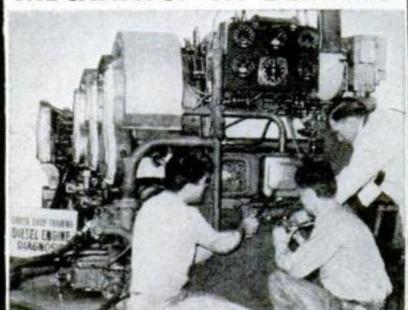
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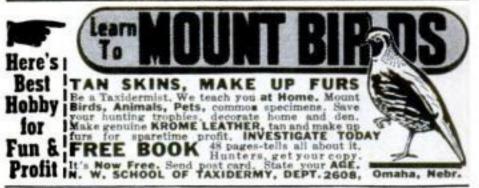
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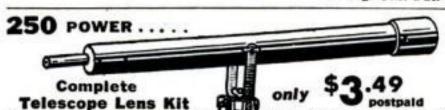
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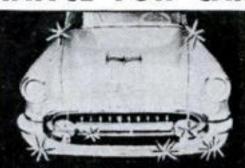
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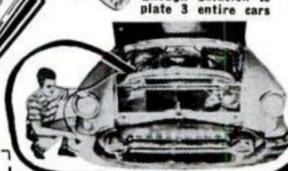
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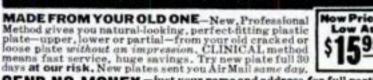
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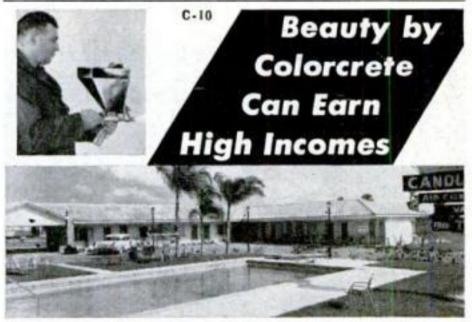
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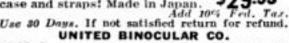
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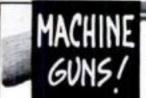
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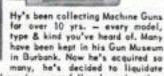


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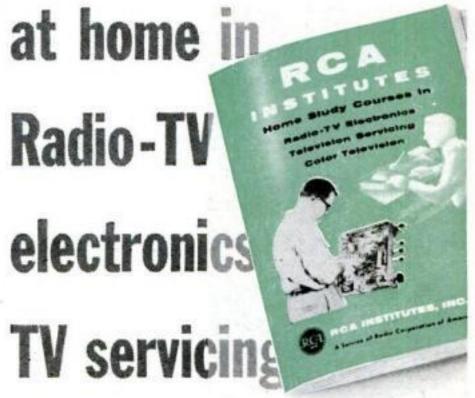


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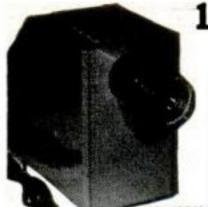
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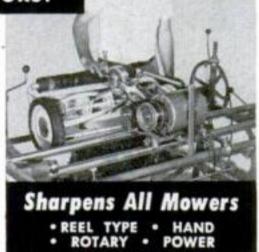
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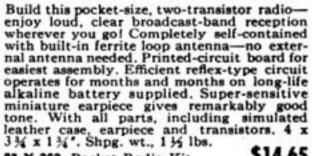
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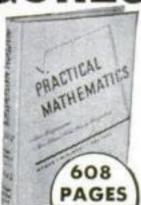
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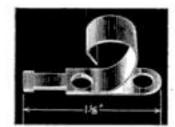
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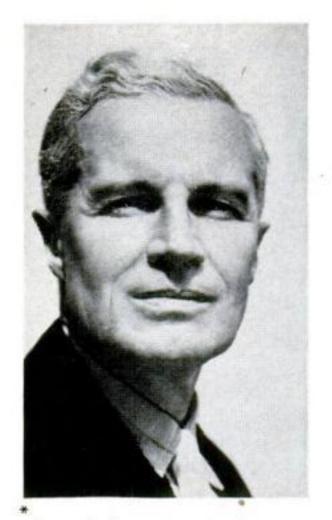
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summer home, my Cadillacs, my Winterlong vacations and my sense of independence—behind all the wealth of cash and
deep inner satisfaction that I enjoy—there
is one simple secret. It is this secret that
I would like to impart to you. If you are
satisfied with a humdrum life of service
to another master, turn this page now—
read no more. If you are interested in a
fuller life, free from bosses, free from
worries, free from fears, read further.
This message may be meant for you.

### By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read; but of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to levels of independence beyond the dreams of avarice.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things; of innumerable laws of nature that will sweep you to success without effort on your part. That sort of talk is rubbish! And anyone who tries to tell you that you can think your way to riches without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be earned! I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

### I Have All The Money I Need

In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. And, in addition, I have the satisfaction—the deep satisfaction—of knowing that I have put more than three hundred other men in businesses of their own. Since I have no need for money, the greatest satisfaction I get from life, is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life,

Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept \*Posed by Professional Model something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

### A Fascinating and Peculiar Business

I have a business that is peculiar—one of my businesses. The unusual thing about it is that it is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows". It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And, it is a business that can be started on an investment so small that it is within the reach of anyone who has a television set. But it has nothing to do with television.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own". It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

### **Are You Mechanically Inclined?**

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will keep your "factory" running 24 hours turn-

ing out a product that has a steady and ready sale in every community. A half dollar spent for raw materials can bring you six dollars in cash—six times a day.

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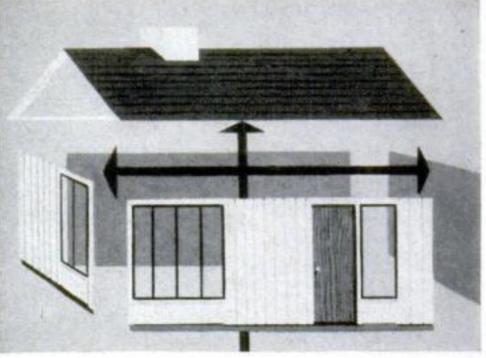
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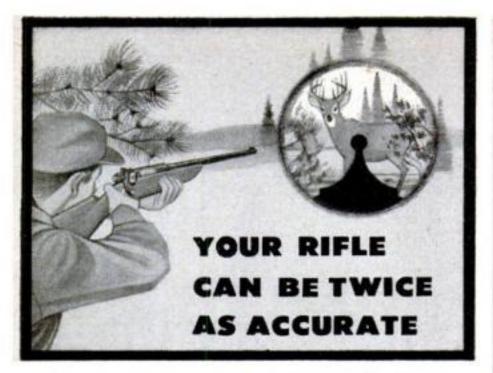
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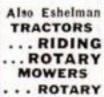
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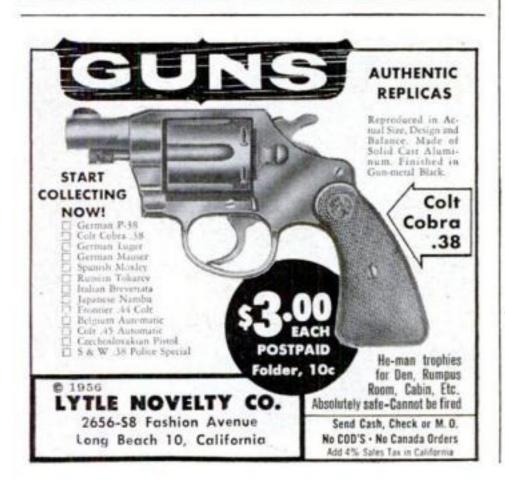


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# "What Makes Cars Cost So Much?"

That's a question that occurs to everyone today including Congress. Its answers are complex and controversial. Some of them may surprise you

### By DEVON FRANCIS

HIS fall, for the sixth straight year, the price that you pay for a new car will probably go up again. Since 1949, the year when automobile factories began to hit their stride after World War II, price increases seem spectacular:

In 1949 the cheapest Chevrolet had an "advertised delivery price"

of \$1,313. The cheapest 1957 Chevrolet: \$1,996.32.

In 1949 a Ford listed at an ADP of \$1,425. The price today: \$1,990.60.

In 1949 a Plymouth listed at an ADP of \$1,397.50. Today: \$2,008.50.

These are ostensible price increases of 39 to 52 percent in eight years. Yet the cost of living, as a whole, has gone up only 17.2

percent over the same period.

Or consider monthly payments. In 1949, after paying one-third down by cash or trade-in, you forked over about \$49.90 a month for 24 months (average payoff time) to buy a new car. Today you are parting with \$57.40 a month for an average of 30 months for a car in an equivalent price class. (Your monthly outlay rockets up to \$80 to \$90 if you buy extras like an automatic transmission and power steering.)

What makes cars cost so much? Three months ago POPULAR SCIENCE began a series of interviews on the subject. We have come up with a lot of answers. Naturally, everybody concerned doesn't agree. The consumer thinks prices are too high—though he keeps

### Don't be misled by the advertised cost of

buying to the tune of 6,000,000 cars a year. This article will report:

How car prices get that way

 Why production-line workers think price rises are unjustified

 The reason cited by the manufacturers for raising them

 The dealers' conviction that higher prices this fall will mean fewer sales, and-

 One unpublicized reason why prices go up.

### How much have prices risen?

Who sets car prices? The manufacturers, of course, set them at the wholesale level. The wholesale prices only roughly determine retail prices.

The posted ("advertised delivery") prices of cars can't be taken at their face value. In 1949, cars sold at more than the posted price, a figure "suggested" to dealers by the factory. Today cars are selling for a lot less than ADP prices.

Each month the Government's Bureau of Labor Statistics collects retail price data in 46 cities from Chevrolet, Ford and

Plymouth new-car dealers. The models surveyed are those selling nationally in the largest volume. Currently, all three are four-door sedans with eight-cylinder engines and automatic transmissions. The "series" used are the Chevrolet 210, the Ford Custom and the Plymouth Savoy. The BLS prices include the extra equipment and accessories that the dealer customarily sells with a new car.

On this basis, the BLS reports that the average true retail price of new cars is up 19 percent over 1949.

True price increases. Though auto posted prices have gone up by a third to a half since 1949, the actual rise is less. Inflation, plus new customs of discounts and over-allowances on trade-ins, make it seem higher. Accurate comparison is hampered by the fact that the product has changed. Today's OHV V-8 with an automatic transmission is a far cry from the six with a stick shift that the Government measured in 1949. Still, making all corrections, Government economists say that cars cost about a fifth more than they did eight years ago.

Other prices are down. There's another way of comparing today's car prices with

### **How Car Prices Are Set**

Wholesale car prices—the ones the dealer pays the factory and which roughly determine the retail prices—are set by a system known as the "standard volume concept." It hasn't changed much in 30 years.

It boils down to this:

A manufacturer estimates his capacity to produce cars in 180 to 190 working days out of some 235 working days in a year. That's his "standard volume." The number of normal working days in a year, counting out weekends and holidays, is around 260. But, in the auto industry, 25 days are deducted for "down time" on production lines for model changes, fluctuations in daily output and vacations.

The manufacturer chooses 180 to 190 working days for production because of the "seasonality" of output and sales.

He calculates his costs on the number of cars he will turn out in that period. Then he takes a rate of profit he considers reasonable, say 20 percent on his investment-a hedge between good and bad sales years—and adds it to his production costs. He figures as best he can the tax bite, and adds that in. Finally, he divides his grand total by the number of cars to be produced. That gives him a wholesale price. To that he adds the federal excise tax of about 10 percent.

That's the price he charges the dealer

at the factory door. If he sells less than

### a new car-take a look at its 'true' price

yesteryear's. That's to put them back-toback with prices of common household items requiring similar materials and labor. The BLS figures show that over the same time span, washing-machine prices went down 3.2 percent, vacuum cleaners 9.2, and refrigerators 29.1.

# What the labor union says

A vocaL and persistent critic of car prices is Walter P. Reuther, president of the United Auto Workers labor union. The UAW has a big stake in the fortunes of the automobile industry—the number of production-line jobs is keyed directly to factory output.

In 1950, assailing the "enormous profits of major automobile manufacturers," Reuther called for price cuts on cars. On a typical Chevrolet, he said, the price could be slashed more than \$300 to the consumer and still leave GM a "generous" return on investment.

GM is Reuther's prime target because it manufactures about half of all U. S.made cars.

The UAW has a bilious eye for the fact

that cars of different make consistently carry price tags almost as alike as peas in a pod. Last September the price of Ford cars went up an average of 2.9 percent to cover the boost in "actual costs for materials and services." Three weeks later, Chevrolet announced its price rise: six percent. Ford promptly matched Chevy's increase.

The UAW marshals many figures to buttress its contention that it's not higher wages that cause higher prices. It says "real" wage increases—measured in terms of buying power—have been more than offset by increased worker productivity due to automatic machinery and "technological advances."

The big reason for high car prices, Reuther insists, is industry's profits. In the last decade, according to the UAW, GM's *lowest* profit on investment after taxes was 19.9 percent, in 1956, and its highest, 39.9, in 1950.

Ford Motor Company's figures are lower. Ford's lowest profit on investment was nine percent, in 1947, and its highest, 27.6, in 1955. In 1956 the company's profit was 12.7.

The UAW adds parenthetically that in

180 to 190 days' production, his profit drops. If he sells more, it's gravy.

Today's actual wholesale price on a Chevrolet 210 series four-door sedan with an eight-cylinder engine and an automatic transmission, radio and heater, is \$1,987. That on the Ford Custom 300 similarly equipped is \$1,985, and that on the Plymouth Savoy \$2,010.

These are wholesale prices. For a theoretical retail price, add one-third of the wholesale figure as the dealer's gross profit (before expenses), then add the cost of transporting the car from the factory to the point of sale, then add whatever state and local taxes that you personally must pay, and then add what the dealer calls his "preparation and handling charge."

The retail price you arrive at is theo-

retical because the dealer can charge you whatever he pleases. What you pay him in the end depends on how hungry he is and how shrewd a trader you are.

Car prices do not, of course, remain fixed. One dealer gives a better price than another, and in the late summer and early fall, all dealers chop prices. That's to move current models off their floors and get ready for new ones.

It is not generally known that the manufacturers cut their wholesale prices at that time too. So price increases imposed at the start of a model year often are washed out at the end.

The factories give discounts to dealers just as department stores put dusty merchandise in the bargain basement to get it sold. Wholesale price discounts of more than \$100 are not unusual.

### You pay too much, says the auto union..

1955 the average after-tax profit on investments by all U. S. manufacturers was only a half to a third those of GM and Ford.

Chrysler doesn't come under Reuther's guns as often because—says the UAW—it has "even less independence" than Ford in setting its prices.

The union contends that ever-higher prices are not warranted—that the manufacturers rig them, using increased wages and the ever higher cost of materials as excuses.

It cites a statement in September, 1952, by Charles E. Wilson, at that time president of General Motors, now Secretary of Defense. Writing in *Reader's Digest*, Wilson said: "I contend that we should not say 'the *wage*-price spiral.' We should say 'the *price*-wage spiral.' For it is not primarily wages that push up prices. It is primarily prices that *pull* up wages." The italics are Wilson's.

The union asks: If last year's boost in the prices of iron and steel (comprising four-fifths of a car) added only \$14 to the cost of making an automobile—on the statement of one trade magazine—how come retail car prices went up an average of \$100?

The union supplies its own answer: There is no price competition among the products of the big manufacturers. There is no "free" wholesale market, as there is for electric toasters, refrigerators and vacuum cleaners. Car dealers are a "captive" market. They pay the prices charged by the manufacturers, or else.

The current car output level "suggests" to the union that the automobile industry is letting a third of its capacity lie idle, adding, "Prices are kept high in order to realize a profit sufficient to permit continuous expansion through self-financing." Should car makers expect their sales to pay for plant expansion? No, according to the union:

"Because prices are kept high, the added capacity can't be utilized. Why not have expansion financed by the investor rather than by the consumer?"

Significantly, the union puts no stress on what recurrent model changes add to car costs. Without this "cycling," hundreds of thousands of production-line jobs would disappear.

# What the manufacturers say

THE auto makers have other thoughts on these matters. Their fundamental attitudes on car prices and what contributes to them follow:

Labor. "There has been," said one industry economist, "a built-in cost increase in every labor contract signed since 1951.

"Automatic machinery and greater efficiency in manufacture-the technological-

### Are Rising Prices Making You 'Buy Down'?

ARE high prices affecting the buying habits of the U. S. motorist? Do the booming sales in low-priced foreign imports indicate a "rejection" of high U. S. prices?

The immediate evidence indicates a possible trend to "buying down." One trade paper reports substantial gains in sales of Chevrolet, Ford and Plymouth standard-transmission, six-cylinder cars because of price-resistance to V-8s and automatic transmissions.

The medium-priced cars' share of the market—that for Mercury, Olds, Buick and Dodge—was 3.17 percent less in the first quarter of 1957 than in the same period of 1956. (But Cadillacs are selling better than ever.)

According to a survey by the Federal Reserve Bank of Philadelphia, dealers think higher prices have brought on buyer-resistance.

There is a considerable body of opinion in Detroit that the buyer-resistance is confined to GM's Olds, Buick and Chevy-that if these cars had been flashier this year, the whole industry would have profited from higher sales.

Anyway, downgrading is not clear-cut. Four out of every 10 Chevrolets, Fords and Plymouths sold now are luxury models, with automatic drives, power brakes, big engines and other extras. In manufacturing, these multiple offerings

### .. Not for what you get, industry replies

improvement factor—do help write this off, but only in part. Every time we install a new automatic machine, we have to make a deal with the union to keep more production workers on the payroll than it actually requires to run it. That's the price of labor peace.

"Even without labor's regular drives for higher wages, we have to meet the cost of an automatic annual 'improvement factor' of six cents an hour per worker, plus adjustments for the cost of living. Both are

in the contract."

in options are known as a "product mix."
It gives the buyer a wide range of choices,
as the corner candy merchant entices
pennies from grubby little hands with a

variety of sweets.

Options serve to catapult low-priced cars into the medium-price bracket, medium-priced cars into the high-price bracket. Ford, for instance, has assumed a lead over both Buick and Olds in the number of power-steering units installed at buyer demand.

The industry denies that there is any long-range downgrading. It points out that in 1949, 22 percent of all cars sold were in the lowest-price bracket. Today it's only 11.5 percent—the bulk of them

to fleet buyers.

A year ago last spring, the low-priced car division of one big company estimated that the public would buy 10 percent of its output as premium cars. The

figure, as of now, is 30 percent.

Manufacturers say that the real index to the health of the new-car market is how used cars are selling. (If dealers couldn't accept, and sell, used cars as down-payments on new ones, they would go out of business.) The volume of used-car sales has gone up almost steadily from 5.6 million cars in 1948 to 9.5 million in 1956. (The curve dipped slightly in 1951 and 1953.) Retail prices on typical two-year-old cars keep rising too. In January, 1956, it was \$1,260. Today it's \$1,376.

"If there's downgrading," said one vice-president, "it should show in a preference for used cars to new ones."

That may be significant. Used-car unit sales are up 70 percent since 1949, new-car sales only 25 percent.

As a final jolter, manufacturers point out that as of June 1, 1957, automobile production workers are getting 47 percent more in wages than in 1949. Compare this, they say, with the increases in wholesale car prices: 25 percent.

Material costs. Every time that steel goes up \$10 a ton, it reaches the car buyer as a boost of \$20 to \$25 a ton. That's inherent in the nature of the manufacturing and distributing process. And the costs of materials used in a car have gone up staggeringly. Drawing on BLS data, auto makers point out that since 1949 wholesale prices have gone up this way:

Iron and steel	54.4%
Other metals	45.3
Metalworking machinery	55.2
Foundry and forge products	43.5
Tires and tubes	50.8
Paint	24.2
Safety glass	13.4

Other consumer durables. One byproduct of price cutting on vacuum cleaners, refrigerators and washing machines,
says Detroit, has been utter chaos in those
industries. Many appliance makers have
gone out of business. Moreover, price cutting is more likely to happen on appliances, where there is less of a style factor,
than on automobiles, where style's heavy
costs in tools and dies must be paid off
more frequently.

Improvement. Car prices go up year by year because cars must be improved to keep pace with a tendency in good times of car buyers to "upgrade" their purchases—to keep buying a better car. "Better" is variously interpreted as more convenient, more stylish or more gadget-fitted.

The manufacturers point out that some items that were optional in 1949 (at extra cost) are considered standard equipment today—such things as turn signals, electric clocks, sun visors.

Data collected by the Survey Research Center of the University of Michigan show that car buyers as a whole "upgraded" at the rate of \$50 a year in "constant dollars"—in prices readjusted for any inflationary effects—in 1946 through 1948, in 1951, and in 1953 through 1955. They "downgraded" only in 1952, and bought the same kind of cars in 1949 and 1950.

Taxes. The federal excise tax on whole-

sale prices has gone up from seven percent to 10 percent since 1949. On a car selling at \$2,000 to the dealer, that's an increase of \$60 passed on to the car buyer.

As for the charge of excessive profits, the industry disputes it. Taking the ratio of profits to sales, GM realized a profit, before taxes, of about \$257 on each car and truck that it sold in 1955, the biggest recent sales year. Ford's profit was \$164 and Chrysler's only \$25. The GM and Ford profits reflect a fantastic volume of sales beyond expectancy. (See the accompanying box, "How Car Prices Are Set.") The profits, in other words, were not set higher, but were the result of sharper estimates of what the buying public wanted.

In 1950, Ford earned a return on investment of 18.6 percent on a sale of 2,000,000 vehicles. In 1956, it earned 9.2 percent on the same number of vehicles despite price increases.

GM's profit before taxes per dollar of total payroll has been as high as \$1, as low as 48 cents; Ford's as high as 87 cents, as low as 22.

It's a volatile, risky business, the industry concludes from all this—the good years must cushion the lean years. The competition is sharp in innovation, if not in prices. Innovation demands research. Research costs money.

As to prices, the manufacturers say: "How do you measure prices? Isn't the criterion the ability to buy—the amount of money in the buyer's pocket, plus the decision to spend?" They produce figures to prove that a "low-priced" car required 31 weeks' pay to buy in 1949 as against only 27 weeks' pay today.

An economist for one big manufacturer said that if five percent were cut from the wholesale price of a \$2,000 car, the company would have to sell 130,000 more cars in a million-car year to make up the \$100 sacrificed on each vehicle. He asked, rhetorically, "Do you think that 130,000 more buyers would be attracted by a small price cut?"

The amount of investment on which the manufacturers have to make a profit keeps going up. Manufacturing facilities keep expanding. For the last 10 years, the industry's production has increased at the rate of three percent a year. As production goes up, plants are expanded or new ones

built. The "investment base" requires more profit.

As for the union's charge that expansion costs are loaded on the car buyer, manufacturers reply, in gist, "Oh yeah? Then why are we in hock to the banks for more than \$650,000,000?"

# What the dealers say

The people who claim to be hurting the most from spiraling prices are the dealers. Automotive News, the trade newspaper, says that dealers' average profit per car last year was \$39, or eight-tenths of one percent on the sales dollar. The previous year it was \$80, or 1.7 percent.

But information published by Robert Morris Associates, a non-profit group of bank-credit men, shows that auto dealers made 13.3 percent on their investment from the year 1935 through 1941. They made 36.2 percent from 1947 through 1952. Their rate of return is now back down to about 12 percent. That's higher than the current return of electrical-appliance shops, lumber-and-building-materials dealers, department stores, shoe stores and jewelers, for example.

Says Carl E. Fribley, of the National Automobile Dealers Association:

"Last September, before the price increase, addressing the Maine dealers, I said that dealers could not absorb any more price increases and that the public was either unable or unwilling to do so. Sales figures show that my prediction—a price increase would mean reduced volume—has come true. Price increases on 1958 models will bring lower volume . . . Unless the automobile is to be priced out of the market, now is the time to lower prices, not raise them."

Some economists suspect that the dealer system of selling cars, with high overhead and salesmen's commissions, is antiquated. Cars, the argument runs, ought to be sold like food in a self-service supermarket.

The manufacturers reply that the auto supermarket could only result in dissatisfied car buyers—they couldn't get the service a dealer supplies. Yet a form of supermarket already exists. It's the "bootleg" lot dealing in spanking-new cars. Bootleg-

[Continued on page 217]

### In PS next month: First report on the 1958 cars

12 years ago this month, the crew of the Enola Gay flew the most momentous mission in military history. This is the co-pilot's story

# How We Dropped the A-Bomb

By Maj. Robert A. Lewis (USAF, Res.) as told to Eliot Tozer

IN THE middle of the morning of Aug. 4, 1945, I walked into the office of Col. Paul W. Tibbets at headquarters I on Tinian Island in the Marianas. Capt. Chuck Sweeney and a couple of other B-29 pilots were already there. So were Capt. William S. Parsons, a Navy technical expert, and a handful of scientists. I knew then that they were going to let us in on the secret.

I could tell by their faces that it was going to be big, but I had no idea that I was going to be asked to help fly the plane that would open the Age of Atomic War.

This was a preliminary briefing for the pilots—in case something happened to Tibbets—and it didn't take long to fill us in. Col. Tibbets, CO of the 509th Group, showed us some films of the first A-bomb explosion at Alamogordo, New Mexico, which had taken place less than three weeks earlier. and said that a single bomb was as powerful as an explosion of 20,000 tons of TNT.

"The brass thinks this one bomb will shorten the war by six months," he said.

As I look back on it now, I remember that he did not use the word "atomic." After 11 months of total blackout, the Security Branch was letting us in on only part of the secret. We weren't to hear the magic words "atomic energy" until after we had dropped the bomb.

"Silence" had been the key word since we first organized the 509th Composite Group at Wendover Field, Utah, in September, 1944. The day we arrived, Tibbets had mounted a sound truck and told us that we were an extra-special unit in many ways.

He said, first, that we would be completely self-sustaining, that we would have our own engineering, troop carrier, and ordnance groups—even our own control tower.

He ended by saying, "You will not talk about this project

Hiroshima, Japan, Aug. 6, 1945: Smoke

billows 20,000 feet into the sky from the first atomic bomb dropped in World War II

to anyone. Don't even speculate among yourselves. If you're pinned down, say that you're in a heavy bombardment group at Wendover and that you're flying B-29s. No more."

He paused. "Anyone who does not want to stay under

those conditions can get a transfer right now."

Some of the guys took him up on it. The whole project had an unreal air about it that made us uneasy.

## A flight ends and an epoch begins



Mission accomplished, the Boeing B-29 Superfortress Enola Gay returns to Tinian, Mariana Islands

But now the strain of holding it in—and waiting—was almost over. Tibbets said: "We're scheduled to take off at 0245 hours the day after tomorrow."

The next morning, Aug. 5, I eased the Enola Gay gingerly off her hardstand and swung onto the taxi strip. This was to be her final test flight, and I was jittery. Four B-29s from other groups on Tinian had crashed and burned that week on the runway.

The B-29's max gross weight is 120,000 lb., and we were all consistently flying them at 130,000-140,000 lb. If an engine so much as sputters on takeoff when you're that overloaded, you've bought the farm.

Those four crashes also bothered Capt. Parsons, the man in charge of the technical group handling the A-bomb. He hot-footed over to Brig. Gen. Thomas F. Farrell, assistant to General Groves, boss of the whole project. Parsons pointed out that a crash on takeoff with a live atomic bomb aboard could conceivably kill several thousand pilots and crewmen and blow up several hundred B-29s.

Farrell said, "Well, maybe you could put the thing together after takeoff. You know how?"

Parsons answered, "No, sir, I don't—but I've got all afternoon to learn."

He was in the air-conditioned Quonset hut with a group of scientists, writing out cryptic instructions to himself, when I took off.

On the final check flight, we went through the motions mechanically. We had already flown over Japan four times, and each time our bombardier, Maj. Tom Ferebee, had put his practice bomb "into the pickle barrel."

Where most bombardiers checked out on the Norden

bombsight after making 20 visual and five radar drops, Ferebee and the other bombardiers in the 509th had dropped 30 bombs a week for eight months, and 60 on radar.

11:30 p.m., Aug. 5, 1945

Church services that night were not actually any different from the services before other missions, but they seemed different somehow. For one thing, almost every man in all 15 crews was there.

Quietly, Chaplain William B. Downey prayed, "May the men who fly this night be kept safe in Thy care, and may they be returned safely to us. We shall go forward trusting in Thee, knowing we are in Thy care now and forever. Amen."

Midnight, Aug. 5

Two hours and 45 minutes to go now before takeoff time. From church, we filed quietly through the tropical darkness to the briefing room.

There was no chatter. The steaming room was dead quiet

when Tibbets stood up.

"Everything is moving according to plan," he said, "except for one thing. There are B-29s returning to Tinian at the middle and upper altitudes. We'll have to fly our first leg at an altitude of 4,000 feet instead of 9,000."

I didn't like that. At that altitude, we were sure to run into cumulus-puffy, bumpy clouds. They'd throw the plane around and Parsons would have a tough time hooking up the wires on the Gimmick.

1 a.m., Aug. 6

Chow. And it was good. Real eggs, not powdered. No one said much. We knew now that Tibbets would take over my plane as Aircraft Commander, and that I would fly as pilot in the right seat. Capt. Chuck Sweeney would be flying The Great Artiste. He would come in over the target about four miles behind us and drop recording equipment to gauge

the intensity of the blast. These readings, telemetered by radio to Sweeney's plane, would be given to the scientists at Tinian. And Maj. George Marquardt, in the unnamed No. 44-191 would lay back about 40 miles and fly in behind us taking pictures. The three of us would rendezvous first

over Iwo Jima.

2:15 a.m.

The flight line was blazing with light. Spotlights drenched the Enola Gay. A hundred cameramen swarmed around her and around us.

They didn't know yet what our special mission was, but they had been told by the brass that "This is the beginning of a new age."

As we broke away and moved toward the plane, cameramen and reporters pulled us aside and asked us to wear

## The crew of the **Enola Gay**



Left to right, front: S/Sgt. George R.Caron, Sgt. Joe S. Stiborik, S/Sgt. Wyatt E. Duzenbury, Pfc. Richard H. Nelson, Sgt. Robert H. Shumard. Left to right, standing: Maj. Thomas W. Ferebee, group bombardier: Capt. Theodore J. Van Kirk, navigator; Col. Paul W. Tibbets, 509th Group CO; Capt. Robert A. Lewis, pilot

their watches, their rings—anything—so they could have a keepsake that went on "The Big Mission." 2:27 a.m.

We started the engines. Tibbets went down the checkoff list slowly and carefully. Then we taxied her off the hardstand out of the bath of newsreel lights and into the soft Tinian darkness.

"Dimples One-Two to North Tinian Tower," said Tibbets.

"Request taxi and takeoff instructions."

"North Tinian TowertoDimplesOne-Two. Take off east on Runway A. Good luck." 2:45 a.m.

Exactly on schedule we eased the brakes and poured on the coal. Tibbets held her down for the full two miles of the runway, so long, in fact, that I spoke to him quietly. "Come on, Paul. Let's go."

We were 16,000 lb.

over max gross, and she came off sluggishly. As we broke ground, I hauled up the wheels. Tibbets held her nose down for another full minute to build up speed, and I began milking the flaps.

At 200 feet, we swung to the left to our heading of 338 degrees. Iwo Jima was 622 miles away.

2:50 a.m.

"Colonel Tibbets from Captain Parsons."

"Yes, Captain."

"If it's all right with you, sir, I'll begin."

"Okay."

I looked back through the half-gloom of the B-29's fuselage and saw Capt. Parsons absent-mindedly knock the bowl of his cold pipe against his heel. He took a last look at the indicator lights on the bomb-control panel by his station, then slid his long frame down into the bomb bay. Lt. Morris Jepson, Parsons' assistant, disappeared behind him.

I looked over at Tibbets, but he was staring straight ahead.

3:13 a.m.

Something went wrong with the intercom. With the switch on "Inter," we were getting both intercom and outside VHF radio transmissions. Had the wiring fouled? Was there a short circuit?

Tibbets ordered us to cut all intercom chatter, but he maintained radio contact with Gen. Farrell back on Tinian as long as he could. They had a code in which each word stood for a sentence.

Farrell asked, "How is Parsons doing?"

"He hasn't come up yet."

We droned on, logging 215 m.p.h., dodging the towering cumulus as well as we could, trying to make it easy for Parsons. He and Jepson were crammed into a small space be-

Enola Gay's bomb shook the world

FIRST ATOMIC BOMB. DROPPED ON JAPAN; MISSILE IS EQUAL TO 20,000 TONS OF TNT; TRUMAN WARNS FOE OF A 'RAIN OF RUIN' RANK JOHNSON Jet Plane Explosion Kills KYISH (ITY RAJED REPORT BY BRITAIN Steel Tower 'Vaporized' NEW AGE USHERED

The New York Times.

In Trial of Mighty Bomb

THE SENATE DES Flore Who Described of Japaneses Craft, Sant Terrores in Record Seat Notes to Both Accessors as Blooding Flore Halled by Frenchest, Section of Seat Notes to Both Control of Manager Craft, Sent Notes to Beautiful Sent Halled by Frenchest, Sent Notes to Beautiful Sent Notes Sent Notes to Beautiful Sent Notes Sent Notes to Beautiful Sent Notes Sent ROCKET SITE IS SEEN HOUSEVEL! AD OTHER

125 B-297 He Spen's Skiders Wracked Norse

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105 B-297 He Spen's Wracked Norse

105 B-297 He Spen's Wracked Norse

105 B-297

Banner headlines heralded first A-bomb. Times noted ushering in of a "new age." Eight days after drop, Japan surrendered

hind the bomb. The light was bad. And we knew his toughest job was hooking up dozens of wires in correct sequence,

for most of the firing system was electrical.

Actually, an atomic bomb is a fairly simple thing. As Dr. Robert Williams, one of the earliest atomic scientists, said, "You merely take several pieces of fissionable material that are as pure as possible and unite them as quickly as possible."

But uniting the materials is tough. You bring together two portions of U-235, enough to make what is a "critical amount." If you have less than the critical amount, nothing happens. If you have more, you get a chain reaction so rapid

that the material explodes.

3:20 a.m.

During the reaction, which takes about 1/10,000,000 of a second, neutrons fly off. If enough escape, the reaction runs down and there is no explosion. To contain the escaping neutrons, you surround the U-235 with a high-density material, such as gold. This reflects the neutrons back into the mass and keeps the reaction going.

Slowly and painfully, Capt. Parsons hauled himself up out of the bomb bay. He said nothing, merely nodded, but we knew the A-bomb was armed.

At the same time, we lost radio contact with Ed Dahl, a civilian scientist back on Tinian. There would be no further help for us now if we got into any kind of trouble.  $3:32 \ a.m.$ 

We still didn't know what was the matter with the radio. I could hear our navigator, Capt. Theodore "Dutch" Van Kirk, and our radar man, Sgt. Joe Stiborik, checking each other's estimate of the wind. Sgt. Bob Shumard and Sgt. Wyatt Duzenbury were paralleling the generators. 4:20 a.m.

Dutch sent me up an estimated time of arrival at Iwo at 0552, and Tibbets, exhausted after 24 hours without sleep, slipped aft to curl up for a catnap. I checked "George," the autopilot, once again, and settled down warily in my seat. 4:45 a.m.

Still at 4,700 feet, still dodging cumulus. Then the moon rose. Somehow it was reassuring to see at least a spot of light in the heavy darkness.

After a short try at a nap, Tibbets came back. I crawled aft to get some pineapple juice and a roast-beef sandwich. On the way forward again, I stopped beside Parsons' station. He was reading his instructions again.

The lights on his control panel were glowing a steady, unwinking green. "What the hell do all these green lights mean?" I asked.

He folded up his sheet of instructions carefully. "Captain," he said, "if all those lights are green, we're in good shape. If some of them go off and the red ones come on, that's not so good."

And I knew he wouldn't tell me more.

"Is it fully armed?" I asked.

"I guess it would go off," he said, "but before we drop [Continued on page 209]

## Twelve years after historic flight



A more or less typical suburbanite, Bob Lewis lives with his family (above) in a new home he helped to build, in Old Tappan, N.J. His hobby is woodworking. For a while after the war, he flew for American Overseas Airlines. Then he went to work for the Henry Heide Co., where he is now personnel manager





There was an awesome beauty, an unforgettable grandeur, in that wasteland

When the Air Force landed a party to build its northernmost outpost in the Arctic Ocean, Popular Science had the only reporter along. Here is his story

By Herbert O. Johansen

WATCHED as the propellers of the five brightly painted C-47s churned up miniature blizzards; as the planes jerked to life, their ski landing gear scudded over the rough snow. Then a roar told us that the first plane had ignited its JATO, boosting it into a steep climb above the whirling clouds of snow. Another roar, then another and another, until all five Gooney birds were airborne, winging south across the polar pack ice to their base at Thule, Greenland.

Now we were alone—seven of us—on T-3, a 140-foot-thick ice island jammed in the Arctic Ocean pack ice 400 miles below the North Pole.

# onaniceIsland



of ice and loneliness that has so often defied man's efforts at conquest.

Our home was a desolate campsite, buried in snowdrifts, that had been abandoned by a party of scientists in September, 1955.

It was 4:30 p.m. on Thursday, March 7. The temperature was 43 degrees below zero. A stiff wind was blowing.

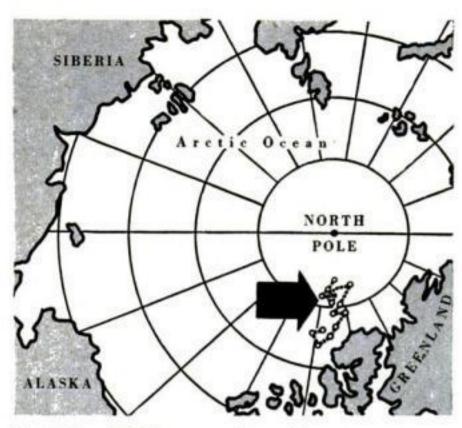
I looked around and asked myself, "What am I doing here?"

I knew, of course. I had come up on a routine, two-week assignment to report on Project Ice Skate—the carving of a 5,000-foot runway out of snow and ice so that huge four-engine planes could land 900 tons of cargo to construct a base. Here, on this 41/2-by-nine-mile ice island, scientists of the International Geophysical Year would man the U. S.'s northernmost IGY station in the world. The men with me, six Air Force specialists, were the survey party for the project.

I left seven weeks later, delayed by bad weather that kept planes from taking me off. I hadn't seen exactly what I had expected to see. And I had done a lot of things I hadn't expected to do. But I, and the Air Force, had learned a great deal about living with the Arctic.

Project Ice Skate: 7 men against the Arctic

#### ICE ISLAND



Ice Island T-3 moves in a zigzag course amid pack of the Arctic Ocean. Arrow shows approximate present location.



By the third day I had become chief cook and bottle washer, and mastered the mysteries of gasoline stoves and lanterns.

## Don't fight the Arctic; it will only fight back harder.



Raising and lowering the northernmost American flag was my privilege. It was always raised briskly, according to the flag code, but at 60 below, lowering was not always ceremonious.



Our operations hut, a



Tons of ice, several inches thick, had to be chiseled and chopped from floors of our hut. Here it's being shoveled up.



Maj. Willie Knutsen slices frozen meat with a snow saw as Lt. Col. Robert Wilson cleans one of our gasoline lanterns.

## Learn to live with it-but that has its problems, too



shelter abandoned by U.S. scientists in 1955, was buried up to the roof in snowdrifts.





## T-3 activity on



Terrific pressures built up when the island starts to rotate cause the polar pack ice around it to heave and fissure, as above, and break into huge blocks.

Water for drinking and washing had to be made by melting snow.
Cutting snow blocks for Science Hall, our second shelter, became another of my chores.
Mask protects the face from frostbite when blizzard winds blow.

## any clear day took many directions, and kept my camera busy



Scientist Norman Goldstein uses ice-filled can as weight to lower thermocouple through 30-foot-deep hole. With voltmeter, he reads ice temps at various levels.

Veteran arctic explorer and T-3 Camp Commander, Maj. Willie Knutsen, wears his "polar-bear" suit. Flags in rear, on bamboo poles, are for marking the runway.





ed materi

#### ICE ISLAND



Hollows in the runway were filled with compacted snow. After a layer had been partially thawed by a Herman Nelson heater, we compacted it by jumping up and down on top. Then came another layer, followed by more jumping.



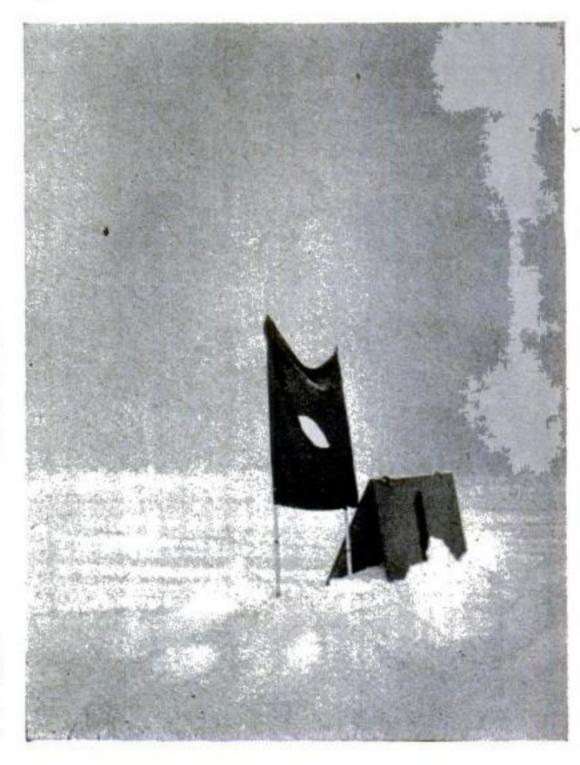
We thought the 5,000-foot runway was ready

## Climax of an Arctic epic: A runway is carved from



Out of the crack-up rolls the C-124's cargo—a 13-ton grader. With it the runway was quickly leveled and planes were able to bring in 900 tons of cargo to build the IGY scientific station on T-3.

The only trees in the Arctic Ocean are these markers stuck in at one end of the T-3 runway. They were flown up especially for the job from Goose Bay, Labrador, more than 1,500 miles to the south.





—until an 18th Air Force Globemaster landed and its nose gear collapsed.

# ice and snow to bring U.S. scientists farthest north





# New Portable Radios: How to Choose Wisely

the control of the state of the said

Today there's a set for every need. But it pays to have the facts in hand before you shop

By Robert Gorman

F YOU haven't taken a fresh look at portable radios recently, you should. The new ones are smaller, lighter, better looking, better sounding, and more powerful. Many are easier on batteries. Four things to keep in mind when

	100					BATTERY DATA					TATE OF THE PARTY								
													AIN mperes)	ESTIMA (ho	TED LIFE				
		TYPE OF OUTPUT STAGE	VER vatts)			(micr per i for milli	ovoits meter r 50 watts put)	OTATABLE ING SET?				ATTS OUTPUT	OUTPUT	ATTS OUTPUT	оитрит	LOWEST ESTIMATED BATTERY COST (per 100 hours)			
	NUMBER OF TRANSISTORS		MAXIMUM POW	MAXIMUM POWER OUTPUT (milliwatts)	MAXIMUM POW OUTPUT (milliw	MAXIMUM POV OUTPUT (millin	SPEAKER SIZE (inches)	SPEAKER SIZE (inches)	NUMBER OF	At 600 kc.	At 1,400 kc.	IS ANTENNA ROTATABLE WITHOUT MOVING SET?	NUMBER	TYPE	TOTAL COST	AT 10 MILLIWATTS	AT MAXIMUM	AT 10 MILLIWATTS	AT MAXIMUM OUTPUT
	6	push-pull push-pull	250 500	4	1 2	650 50	750 50	yes yes	8	1½ v. (C size) 1½ v. (C size)	\$1.60 1.60	n.a. 17	n.a. 60	1,200 1,200	n.a.	\$ .13 .13			
	5 6 7	single push-pull push-pull push-pull	60 125 350 225	21/4 3 51/4 51/4	2 2 2 2	300 150 150 150	400 200 200 200	no no no	1 2 6	9 v. 9 v. 9 v. 1½ v. (D size)	1.60 1.60 3.30 1.20	15 10 13 13	n.a. n.a. n.a. n.a.	80 150 1,500 1,500	n.a. n.a. n.a. n.a.	2.00 1.07 .22 .08			
	4	single push-pull	85 275	23/4	1 2	n.a. 250	n.a. 150	no no	1	9 v. 9 v.	1.85 1.50	15 12	17 44	200 350	185 60	.93 .46			
	4 6 4 6	single push-pull single push-pull	75 270 75 300	23/4 4 23/4 4	2 2 2 2	n.a. 350 n.a. 350	n.a. 325 n.a. 325	no no no	1 1 2	9 v. 9 v. 9 v. 9 v.	1.85 1.65 1.85 3.30	8 7 8 7	9 40 9 40	250 n.a. 250 n.a.	n.a. 750 n.a. 2,500	.74 .22 .74 .13			
	6	push-pull	300	31/2	2	400	450	no	6	11/2 v. (C size)	1.20	9	35	300	75	.40			
	6	single push-pull	n.a. n.a.	4	1 2	n.a. n.a.	n.a. n.a.	yes yes	2	9 v. 9 v.	3.30 3.30	n.a. n.a.	n.a.	2,000	2,000 1,500	.17			
	4	single push-pull	40 300	23/4	2 2	n.a. 300	n.a. 300	no no	4	11/3 v. (AA size)c 11/2 v. (D size)	3.00 .80	17 25	30 60	130 250	90 100	2.31 .16			
	6	push-pull push-pull	160 100	2½ 2½	2	126 252	142 285	no no	4	1½ v. (C size) 1¼ v. (AA size)	.80 9.00	13 13	38 34	125 125	50 60	.65 see tex			
	6	push-pull	130	23/4	2	400	400	по	1	9 v.c	2.25	10-	25	100	50	2.25			
	6 6 7	push-pull push-pull push-pull	170 170 200	23/4 23/4 4	2 2 2	400 200 75	500 250 50	yes yes yes	4 2	1½ v. (AA size) 1½ v. (AA size) 9 v.	.68 .68 3.30	15 15 8	45 45 35	n.a. n.a. n.a.	n.a. n.a. n.a.	n.a. n.a. n.a.			
	7	push-pull	100	23/4	2	n.a.	n.a.	no	2	1½ v. (D size)	.40	19	30	360	250	.11			
<u> </u>	4 6 7	single push-pull push-pull	40 100 300	21/8 23/4 4x6	1 2 2	n.a. n.a. 130	n.a. n.a. 100	no no no	1 1	9 v. 9 v. 9 v.	1.35 1.35 1.35	16 11 16	n.a. n.a. 60	55 75 500	n.a. n.a. n.a.	2.42 1.80 .27			
	7	push-pull	325	4	2	300	300	no	6	11/3 v. (AA size)°	5.10	12	48	150	55	3.40			
	5 7 7	single push-pull push-pull	70 150 400	2¾ 2¾ 4x6	2 2 2	n.a. 400 450	n.a. 300 300	no no no	1 2	9 v. 9 v. 9 v.	1.10 1.10 3.30	17 10 n.a.	17 25 28	50 100 1,200	50 50 500	2.20 1.10 .28			
	7	push-pull push-puH	180 800	2¾ 4	1 2	260 90	260 90	no no	8	11/3 v. (AA size)° 11/2 v. (C size)	3.00 1.60	n.a. n.a.	n.a. n.a.	400 150	n.a. n.a.	.75 1.07			

NOTES: n.a. Information not available \* Earphone available at extra cost

b Carrying case available at extra cost

Mercury, alkaline and carbonzinc batteries that are physically and electrically inter-

changeable are available for this model; figures given are for mer-

	Shopper's Guide:			oth)			(S)			SENSI' (micro per n for millio	volts neter 50 watts	ATABLE SET?	
TUBE SE	TS	ATE PR batterie	VTE ounds)	SIZE (inches-height, width, depth)	NUMBER OF TUBES	POWER SUPPLY	MAXIMUM POWER OUTPUT (milliwatts)	SPEAKER SIZE (inches)	TUNED R. F. STAGE	output)		MOVING	
MAKE	MODEL	APPROXIMATE PRICE (including batteries)	APPROXIMATE WEIGHT (pounds)							At 600 kc.	At 1,400 kc.	IS ANTENNA ROTATABLE WITHOUT MOVING SET?	
ADMIRAL	202*	\$ 35	51/2	9 x 10½ x 3	4	3-way	250	4	no	160	100	yes	
ANDREA	W69-Pb	176	32	12¼ x 17½ x 8	6	3-way	250	61/2	yes	75	35	yes	
ARVIN	8571P	37	53/8	8% x 10% x 3¼	4	3-way	180	4	no	180	160	no	
BULOVA	220 247	34 54	21/4 41/2	5% x 6% x 2¼ 6% x 9¼ x 3¼	4	battery 3-way	125 160	4 31/2	no no	240 250	150 150	no no	
DEWALD	E-517	37	6	71/4 x 85/8 x 4	4	3-way	150	4	no	350	325	no	3
DUMONT	RA-354	45	n.a.	6¼ x 9¼ x 3%	4	3-way	180	4	no	160	80	по	
EMERSON	856ª 843	37 n.a.	13/8	3½ x 6 x 1¼ 7¼ x 9½ x 3½	c d	battery battery	n.a.	2¾	no no	n.a.	n.a.	no no	
GENERAL ELECTRIC	P671ª	35	51/4	6½ x 9% x 3¼	4	3-way	300	4	no	56	40	no	
MONTGOMERY WARD	GEN 1090A GEN 1105A GRX 1089A <sup>1</sup>	21 34 72	31/4 5 153/4	51/4 x 7 x 21/2 61/8 x 81/4 x 23/4 107/8 x 14 x 71/2	4 4 5	battery 3-way 3-way	180 170 250	4 4 (two)	no no yes	175 175 18	125 125 5	no no no	
MOTOROLA	5P31 6P34°	37 55	6½ 6½	10½ x 8¾ x 2⅓ 10½ x 9⅓ x 2½	4	3-way 3-way	300 300	4	no yes	100	70 7	yes yes	
PHILCO	671 676	35 53	47/8 51/4	6¼ x 9½ x 3½ 6¾ x 10 x 4	4	3-way 3-way	190 190	4	no no	n.a.	n.a.	no no	
RCA	8BX5 8BX6	34 44	5 51/2	7 x 10½ x 3¼ 8 x 10¾ x 3⅓	4	3-way 3-way	85 230	4	no no	310 80	110 40	no yes	
SYLVANIA	3304	45	41/8	7 x 9¾ x 3½	4	3-way	240	4	no	200	125	по	
WESTINGHOUSE	563P4 557P4*	28 38	23/8 4	5¾ x 7½ x 2½ 6¾ x 8¾ x 3⅓	4	battery 3-way	150 200	3½ 3½	no no	400 400	250 250	no no	
ZENIŤH	A 400 A 402 A 404L A 504 <sup>a</sup>	36 43 46 54	5 5¾ 5¾ 5¾	6½ x 10½ x 2⅓ 7½ x 10½ x 3¼ 6½ x 10⅓ x 4¼ 7½ x 10½ x 3¼	4 4 4 5	3-way 3-way 3-way 3-way	290 270 270 290	4 4 4 4	no no no yes	90 150 95 46	200 100 70 46	no yes no yes	
	А 600ъ	148	n.a.	12 x 17% x 8	5	3-way	500	51/4	yes	43	16	yes	

NOTES:

n.a. Information not available

a Carrying case available at extra cost

b Has short-wave bands

e "Hybrid" set uses 3 tubes and 2 transistors d "Hybrid" set uses 3 tubes and 3 transistors e Earphone available at extra cost

		1	BAT	TERY D	ATA		(8.5)	SEPEN.	
				DRA (millian	(IN mperes)	ESTIN LII (hou	FE		
	NUMBER	TYPE	TOTAL COST	AT 10 MILLIWATTS OUTPUT	AT MAXIMUM OUTPUT	AT 10 MILLIWATTS OUTPUT	AT MAXIMUM OUTPUT	LOWEST ESTIMATED BATTERY COST (per 100 hours)	
	{1 1	7½ v. 90 v.	\$1.35 3.75	n.a.	n.a.	n.a.	n.a.	n.a.	
	12	4½ v.) pack 45 v.)	6.00	{76 {16	78) 18)	150	150	\$4.00	
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shopping for portables are price, upkeep, performance and looks. The list prices in the accompanying charts will give you a start at picking a set on cost alone. Some price qualifications should be noted:

 Actual prices will vary with locality, season and store. List prices, in many cases, are simply a jumpoff point for trading.

 Many manufacturers house the same chassis in several grades of cabinet, with prices adjusted according to the degree of flossiness. Try to buy by chassis number, not glitter.

3. Price alone should obviously not dominate if you have special requirements. If, say, you want to pick up shortwave weather bulletins aboard your cabin cruiser, a set that will tune to the shortwave band is clearly called for.

Tubes or transistors? Vacuum tubes and self-powered electronic gear are rapidly nearing a parting of the ways. The reason: transistors.

A transistor is an amplifying crystal that can handle most jobs now done by vacuum tubes. It gets its effect by controlling the flow of electrons through a "semiconductor"; a tube controls electron flow in a vacuum. Transistors are ideal

## How to be a smart buyer

THERE'S a sizable difference between the list price of a portable and what you may get it for if you shop wisely. Many discount houses now offer service and quality guarantees; and department stores and appliance dealers are out to meet the price competition. Portables are also sold in hardware, auto-supply, and even drug stores. But to be sure you're getting a real bargain, here are some things to ask a dealer:

1. Will he give you a cash refund or at least exchange defective merchandise—within a reasonable period?

2. Does he provide service himself? Some dealers tell you they guarantee a set when they really mean they'll send it back to the manufacturer. Factory service may take months.

3. Will he demonstrate or let you test the sets you want to hear?

4. Is the price right? To beat bargain hunters, some dealers mark a phony "list price" on store tags, and offer equally phony bargains. To make sure you're really getting a deal, check his price (including batteries) against the list price in the PS chart.

## How to save your batteries: cool them, rest them, use them in pairs

BATTERY cells create electricity by chemical action-which speeds up at high temperatures. So whenever you can, store and use your radio in a cool place. If you carry it in a car, keep it out of hot boxes like the glove compartment or rear-window ledge. At home, keep it away from sunny windows in summer and radiators in winter.

If you're not going to use your portable for a spell, store the batteries (along with any extras you may have) in the refrigerator. It's a good idea to wrap them in a moisture-retaining plastic bag. Before you reinstall the batteries, let them stand for a

couple of hours at room temperature in the plastic wrapper. (Don't store your radio in the refrigerator; moisture condensing on metal parts will cause corrosion.)

Several transistor portables that hold two nine-volt batteries will work satisfactorily on one. But as a rule of thumb, you can figure that paralleling two batteries gives triple the life of a single one used by itself.

Batteries last longer if you give them a rest once in a while. A long continuous session will take more life from your batteries than an equal number of hours with periodic rests.

for portable equipment: They are small, light and rugged; in some applications they last so long that engineers still don't know their service life.

A more important advantage: Transistors need little juice. Where a conventional portable needs a separate "A" battery to fire electrons out of vacuumtube cathodes, plus a high-voltage "B" battery, transistor sets get along fine with a single, low-voltage power source.

This actually adds up to three advantages: greater battery economy, simpler power supplies, and smaller size. With the exception of two Emerson hybrids that mix tubes and transistors, all personal-size radios (smaller than about four by six by two inches) are to be found in the transistor-radio chart.

Battery economy shows up even better in some of the larger transistor portables because there's a big spread between the maximum current a battery can put out and its most efficient rate of delivery. For any given circuit, larger batteries will be cheaper in the long run.

Tube sets still have some valuable features. They cost less than half as much because tubes are both cheaper and give more amplification per unit than transistors. A good four-tube radio is easily equivalent in performance to a six- or seven-transistor job.

Higher battery cost, incidentally, doesn't necessarily mean higher operating cost. Most vacuum-tube portables operate on house current as well as on batteries. Any time you're indoors or near an outlet you can reduce battery drain to zero. So, as a year-round extra radio that you can also take along on your vacation, a vacuum-tube portable may be a fine choice.

How much circuitry? The number of tubes used in a portable usually shows up directly in the price. Extra transistors also add to the price, but in the long run they tend to bring down the cost.

It may seem strange that adding transistors should reduce the amount of current a circuit needs. Transistors get along on very little juice, but they do need some. So it stands to reason that each extra one should increase the drain.

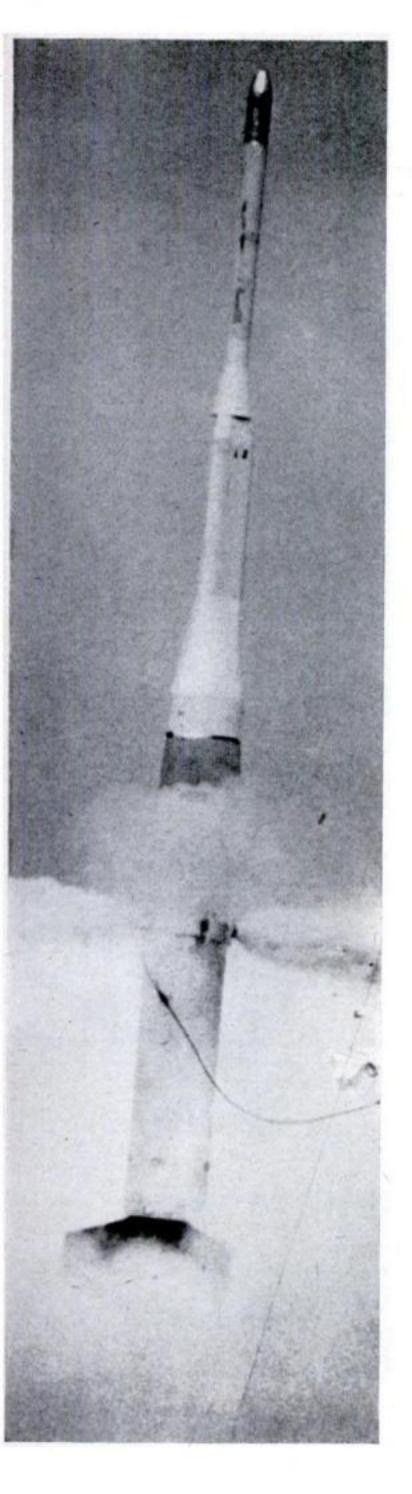
Why doesn't this happen? Well, for one thing, more expensive sets often incorporate extra circuit refinements and better components that can improve efficiency. Then, too, the type of output stage —the part of the circuitry that drives the loudspeaker—affects battery drain. single-ended stage, with only one transistor (or tube), must draw current at a fairly high—and steady—rate to give the needed sound output. Battery drain is high whether you're playing the set loud or soft.

Another transistor added to the output stage permits a "push-puil" arrangement that will use less current when the volume is turned down. (There are no

[Continued on page 211]

NEXT MONTH: What's all this talk about tape recorders? Do people buy them for sensible reasons? What will two million owners find to fill three million miles of tape this year? Is magnetic recording hi-fi? These are some of the questions Popular Science will answer, in the September issue, in:

# "Why Buy a Tape Recorder?"



# New U.S. Missiles Attack the Heat Barrier

Spectacular trials pave way for transocean projectiles and planes of unheard-of speed

By Alden P. Armagnac

RACING with Russia, U. S. experts are believed to be near success in perfecting the most fearsome weapon in history—the Intercontinental Ballistic Missile. Our "crash" program to develop it, as urgent and super-secret as the project that yielded the first atomic bomb, has already reached the test-firing stage according to unconfirmed but convincing reports. Apparently solutions are being found for problems as formidable as the design of the ICBM's nose cone—the wrapping for its lethal package.

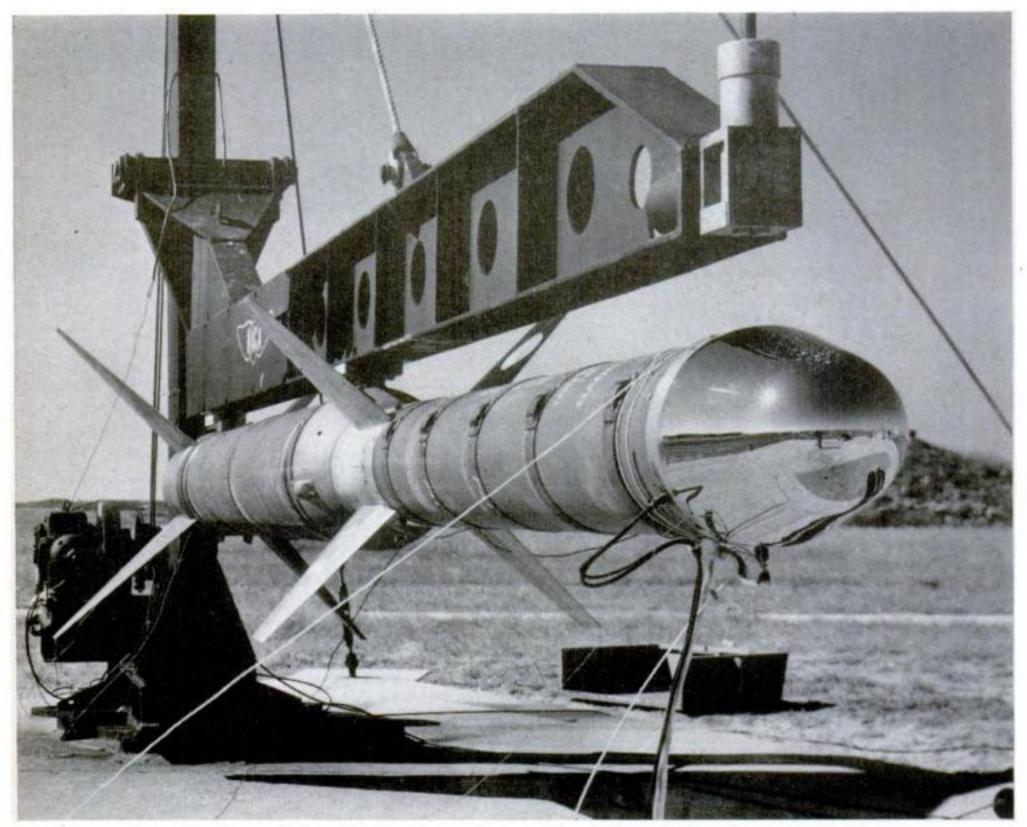
What goes into the ICBM's business end is no secret: a hydrogen warhead. What shape the nose cone will take, recent promising trials suggest: a "blunt" rounded one, perhaps like the smaller end of an extra-plump pear. But what kind of stuff to make it of has been a mystery challenging the best brains of General Electric, Avco and Lockheed—three leading U. S. firms assigned prime contracts for this supremely important bit of hardware.

For an ordeal by heat, which no object has ever been called upon to survive before, faces the ICBM. After a 5,000-mile trajectory through airless space, the missile's warhead will plunge downward toward its target like a meteor. Re-entry into the earth's atmosphere at 20 times the speed of sound will expose it to a temperature of 10,000 degrees F. or more, hotter than the surface of the sun.

How can it be kept from burning up-just as the

HUGE "RE-ENTRY" TEST VEHICLE for ICBM nose-cone trials, the X-17, starts aloft. Sideward jets spin the four-story-high, six-ton rocket craft to stabilize it. At top of climb, vehicle turns over and hurls itself earthward like a meteor.

# Will the business end of the Intercontinental Ballistic Missile look like this?



made of Inconel, shows two striking features that may help ICBM survive sunlike heat: blunt

tip, and mirror finish, reflecting NACA test site. Two-stage rocket suffices for initial Mach 5 trial. (Photo courtesy Aviation Week.)

projected earth satellites are expected to come to a fiery end when they fall back from space into air?

To find out, researchers have been testing heat-resistant metals and refractories
at the highest temperatures attainable on
earth—in solar furnaces, in shock tunnels, in concentrated electric arcs, even
in the fireballs of atomic bombs. To try
out promising ICBM nose-cone materials
and designs, fantastic things are being
shot into the air.

Five-stage rockets, believed the first

in the world with so many components, are now being launched at Wallops Island, Va., in nose-cone experiments by the National Advisory Committee for Aeronautics. Each of these "hypersonic test vehicles" reaches the top of a near-vertical ascent on two stages' power. Then it tips over—and while it's falling toward the ocean, the last three stages fire, driving it downward at a speed estimated to reach 8,000 m.p.h.

Still more spectacular, the big-scale X-17 Re-Entry Test Vehicle stands four

FASTEST JET PLANE, the F-104. begins edging into the "thermal thicket" at its reported top speed of Mach 2.



stories high and weighs six tons. This Lockheed-built monster of three rocket stages is another "over-the-top" craft, with a nose-cone experiment at its tip. Two stages drive it aloft, it up-ends, and then the third stage turns it into a shooting star. About 20 of the X-17's have been launched from Patrick Air Force Base in Florida, at this writing.

Officially they're called "highly successful" and the rest is secret. By various unconfirmed reports, the X-17 has reached a record speed of more than 9,000 m.p.h., something like 14 times the speed of sound; apparently it doesn't burn up, being said to be aimed so that the last stage comes down in shallow ocean waters, where the remains can be recovered for examination. The story goes that one X-17, which failed to turn over and kept on going up, zoomed into space to an unintended altitude record of 600 miles.

Many besides the ICBM's designers are concerned with the searing heat generated by air friction at terrific speed. Today it confronts aeronautics with a new obstacle—the heat barrier, or "thermal thicket," as engineers prefer to call it. For you never get past it. The faster a plane or missile goes, the hotter it gets —until its wings warp, or its nose melts, or it vanishes in a puff of smoke. The ICBM is the extreme example, but not the only one, of coming vehicles that will call for novel materials to defy the searing heat.

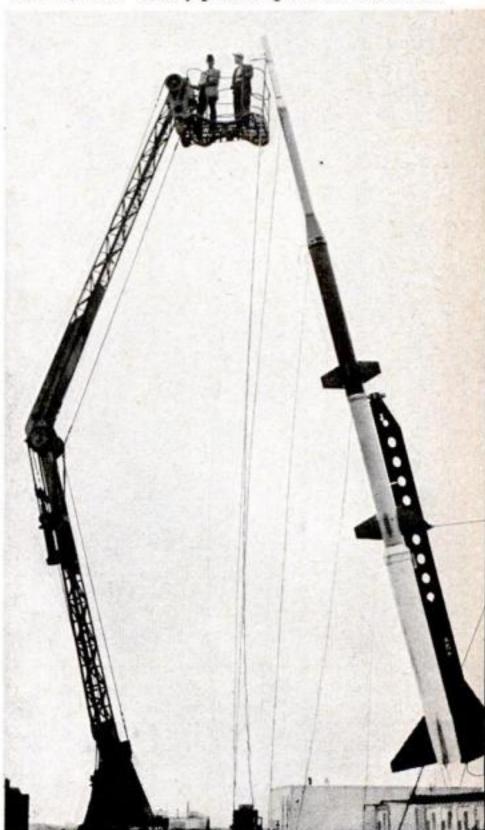
Missiles have already tangled with the thermal thicket and come back singed. At Wallops Island, before developing its five-stage rocket, the NACA fired a series of four-stage Hypersonic Test Vehicles. Several of the first ones mysteriously veered and crashed, within a few seconds after launching. Their tail fins of cast magnesium were being burned off, investigators found, by aerodynamic heating at four times the speed of sound. Sheathing the fins' leading edges with heatresistant Inconel alloy proved a successful remedy, enabling the four-stage rock-

ets to reach an officially confirmed top speed of 6,864 m.p.h.

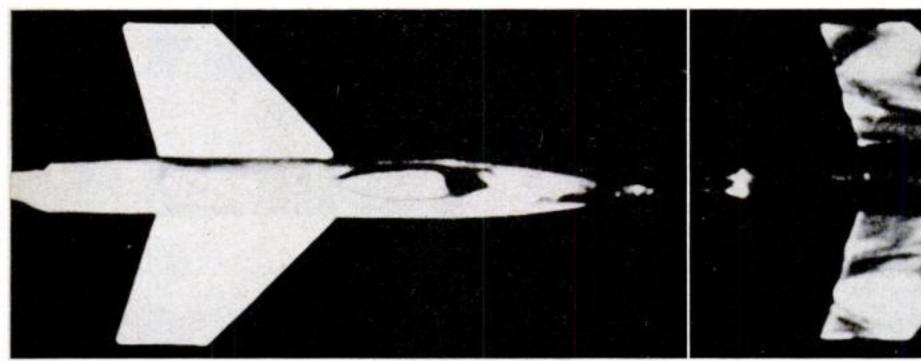
And now manned aircraft—phenomenally tripled in speed since the conquest of the sound barrier, only 10 years ago are beginning to penetrate the thermal thicket. Due soon to come to grips with it are bullet-fast interceptors and bombers, satellite-launching rockets, and the first piloted spacecraft. Within another decade, man-carrying craft 10 times as fast as sound are foreseen by Lt. Gen. C. S. Irvine, Air Force deputy chief of staff for matériel.

Where does the heat barrier begin? Last well-marked outpost before you get

FIVE-STAGE ROCKET VEHICLE, believed first of kind, now serves for NACA's highest-speed nose-cone tests. Its size is shown by comparison with men on "cherry-picker" platform beside it.



AUGUST 1957 9



MODEL'S FIERY ORDEAL shows what would happen to stainless-steel plane flying at 4,500 m.p.h.

and 50,000-foot altitude. Terrific heat of air friction turns the sharp nose into a molten

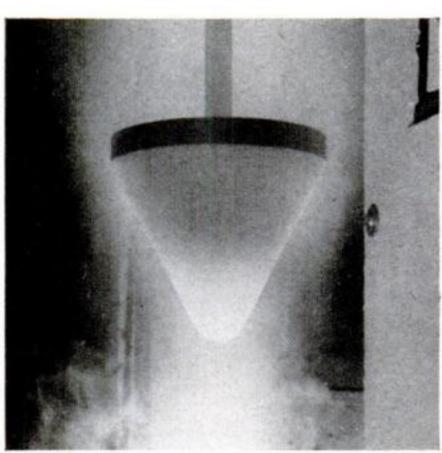
there is the speed of sound—"Mach 1," in engineer's language. It ranges from 761 m.p.h., in the average 59-degree temperature at sea level, down to 643 m.p.h. in the stratosphere's average minus-67-degree temperature. ("Mach 2" is twice as fast as sound, and so on; when supersonic speeds get to Mach 5, the engineers begin to call them "hypersonic.")

Well beyond Mach 1, you enter the thermal thicket gradually. Take a modern fighter plane barreling along at Mach 1.5, half again as fast as sound. Even in the stratosphere's frigid air, its metal skin gets hot—just as hot as if the plane were sitting on the ground at Azizia in

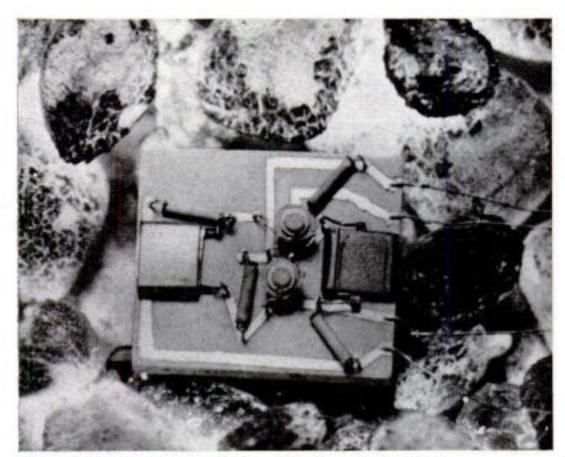
North Africa, on that memorable September day in 1922 when an official thermometer registered an all-time world heat record of 136 degrees F.

Called "the missile with a man in it" and the world's fastest jet plane, the Air Force's Lockheed F-104 Starfighter can overtake a 16-inch shell in mid-flight. It's unofficially credited with Mach 2 speed. At that pace its skin heats to a hotter-than-boiling 230 degrees.

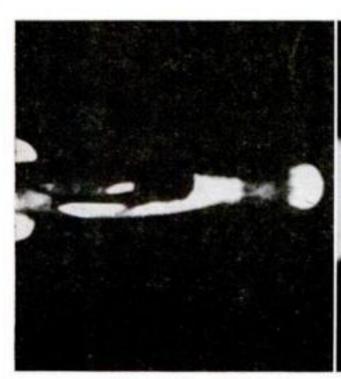
Built to probe the thermal thicket, the experimental Bell X-2 rocket plane was the speediest piloted vehicle of all time. It reportedly exceeded 2,100 m.p.h. before it crashed and its pilot was killed,

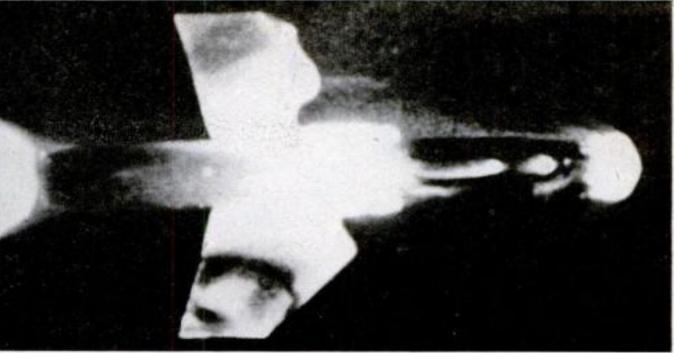


CONCENTRATED ELECTRIC ARC of more than 25,000 degrees F., called the highest sustainable temperature yet produced in the laboratory, tests cone of carbon at University of Chicago.



CERAMIC VACUUM TUBES, developed by GE, work nicely in circuit resting on glowing coals. They're an example of high-temperature equipment for craft to invade "thermal thicket."





blob. Wings—leading edges melting—are about to drop off in last of successive views. This

NACA test put stationary model in hypersonic rocket-exhaust jet to simulate Mach 7 speed.

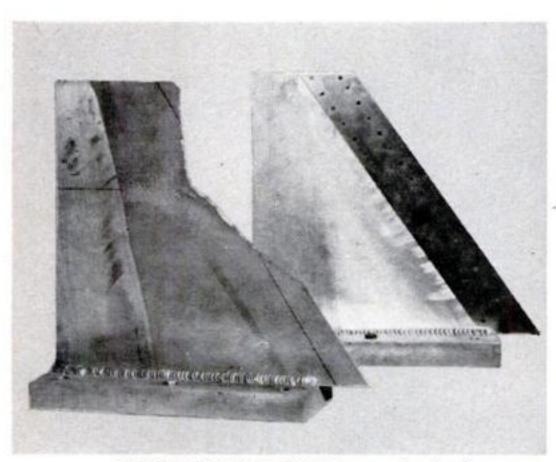
last September. Its Mach 3 speed, fast as a high-powered-rifle bullet, must have subjected it to a burning 600 degrees. Sensationally fast fighters and bombers, coming up, are expected to give the Air Force the first "operational" planes in the Mach 3 class.

So near that its test pilot has already been chosen is the first manned space-craft, the experimental X-15 rocket plane that North American is building for the Air Force. Reports of the altitude that it's intended to reach vary upward from 40 to 100 miles or more. It's rumored to be a Mach 5 craft or better. And if it turns on that kind of speed within

the earth's atmosphere, it's going to glow red-hot, like spaceships of the future during "re-entry."

How do you keep from cooking the pilot of a flying oven? Heat-insulated cabin walls help, but not enough. Currently the answer is to refrigerate the cabin, with an arctic blast from a compact but mighty air conditioner—which itself consumes more than 2,500 horsepower, in one of the fastest experimental planes now flying. Next step probably will be to put the pilot in a refrigerated suit, of which a trial version has been created by the Air Force's space-fashion designers.

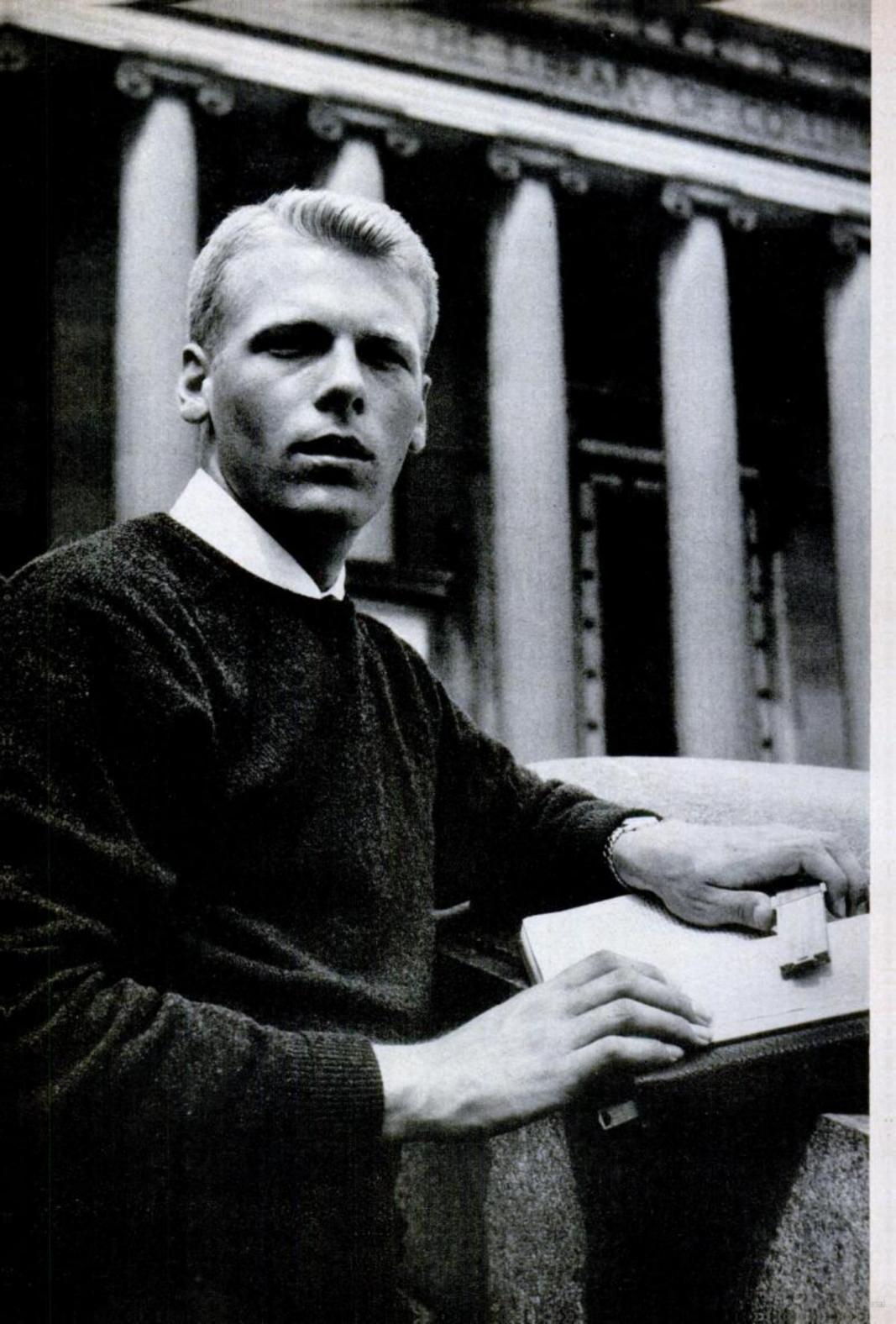
[Continued on page 214]



ROCKET-CRASH MYSTERY was solved when magnesium fins were found burned away (left) by encounter with heat barrier. Cure was to sheathe fins' leading edges with Inconel alloy (right).



MISSILE CONE of special Corning glass goes into oven to be turned into white ceramic-like substance—one of a new group, called Pyrocerams, that rival best of heat-resisting metals.



# You <u>Can</u> Afford to Send Your Child to College

The cost of a college degree looks sky-high. How can you manage it? By taking advantage of all money-raising angles

## By Vance Packard

HAVE visited 17 college campuses and talked with leading authorities on financing a college education. I came back with exciting news for the average American family, people whose incomes run from \$4,000 to \$7,000 a year.

I found that a college education for their children is within reach—if they take advantage of all the possibilities. And they can do it without undue strain. I learned that a fifth of all college students today come from families with incomes of less than \$3,000.

Today every college has officials ready to sit down with you and map out a program for financing your child's education. They talk of installment payments, learnwhile-you-work plans, loans, scholarships. The outright dollar assistance they can offer worthy students has doubled in the past few years.

How much will you need? The typical range is from about \$1,250 per year for a state university to about \$2,375 for a private women's college. Costs are highest in New England colleges, followed by the Midwest, the West and finally the South. The overall national average is \$1,600 per year.

If you gasp at these figures, remember this: Living costs, not educational costs, account for at least \$800 of the total. It is expensive to feed, house, clothe and amuse a young man or woman today. Your youngster is going to eat up \$400 in food during a nine-month period, at home or at school. (It may be cheaper

to feed him, mess-hall style, in school.)
Where will all that money come from?
It's easier than you may think.

Ideally, you should start your planning—and saving—several years before college. But few people do. And some students manage at expensive schools such as Amherst and Princeton without a penny from their parents. It's rugged, but can be done.

Let's assume the worst. You have no savings whatever. Your income is \$5,000 a year. Where will your youngster get the money for college? There are four places besides your own resources.

- Part-time work during the school year
- Summer jobs
- Scholarships
- Loans

A job at college? Nearly two-thirds of all college men work part time during the school year. At the University of California in Los Angeles more than 80 percent work. Even at so-called rich boys' schools such as Yale and Harvard, nearly half do.

The colleges search out good jobs. The University of Chicago, for example, flatly guarantees all the part-time work a boy wants. Most schools like male students to work—it's educational. Many colleges, such as Ohio State University and the University of California at Santa Barbara, will even arrange class schedules to fit work hours.

What kinds of jobs? They range from taxi driving, waiting on table, servicing cars, and house painting to taking care of lawns, washing windows, selling books,

## Scholarships, loans and part-time jobs all help . . .

working as a plant guard. At Stanford University, more than a dozen students are firemen, earning free board, room and laundry, plus \$20 a month. You should bear in mind, though, that job opportunities at a college in a small, isolated town are fewer than at a big-city school.

Special skills. Some marketable skill that your youngster can take to school helps out—can he type, repair auto engines or play in a dance band? He will command more money and be in greater demand. In California a young married man with three children decided—even though he had no financial backlog—to try to become a doctor. He managed it by, of all things, spending a few months learning carpentry. He became good enough to be accepted by the union and earned—while in medical school—\$2.50 an hour (most collegians earn less—\$1 to \$1.75 an hour).

This man worked 25 or more hours a week and still managed to be an honor student. Fifteen hours is a better work goal, however, permitting more time for studies and campus activities. Such a schedule, even at \$1 an hour, would yield nearly \$550 each school year. The average working student makes \$450.

You may want to look into schools with full-fledged work-while-you-learn programs, which pay almost all expenses.

Antioch College in Yellow Springs, Ohio, pioneered this idea with its five-year program. Students study on campus half the time and work in all corners of the globe the other half. Two students share one full-time job so that it is always filled, and they are paid more than \$50 a week while they work.

Today 43 different schools, including many of America's leading technological institutes, have these "co-op" programs. They include the University of California, University of Georgia, Massachusetts Institute of Technology, Northwestern, Purdue, Cornell, Rensselaer and Drexel.

Here's how one man took advantage of Husky Richard the co-op program. Knapp, like his father, was a foundry worker near Chicago. He felt he was "stuck in the foundry" and says, "I had assumed I couldn't afford to go to college." Then he heard that his company was sending two men to Illinois Tech under a co-op program. He applied, was accepted. During his college years the company paid \$3,000 in tuition for him, and gave him \$7,000 in paychecks. When he started college he was making \$50 a week. By graduation he was making \$80 and became a production engineer.

If you would like detailed information

## Find out about scholarships—there are more than you'd think

Don't overlook any chance to help your youngster get a scholarship. So many are offered that no one person knows about them all. Here are eight sources of information that you should check:

- 1 The high-school guidance counselor will have leads on scholarships that are available locally.
- Write to the admissions officers of the colleges your youngster is considering and ask for their printed material on scholarships. (These also usually contain information on loan funds.)
- 3 If you work for a large company ask the personnel director if the company has any scholarships, tuition-refund plans or loans for college students. It probably will have. The book You Can Win a Scholarship (\$2.98, Barron's Educational Series, Inc., 343 Great Neck Road, Great Neck, N.Y.) lists 51 firms that have scholarship programs.
- 4 If a member of your family belongs to a union, check the local about scholarship possibilities, or write to the AFL-CIO De-

partment of Education, 1625 I Street, Washington 6, D. C., for its list of scholarships.

- Ask your minister what scholarships may be available to schools affiliated with your church. The Methodist Church, for example, publishes a list of its scholarships.
- 6 Write the Department of Education of your state for information about scholar-ships offered by the state government.
- 7 For information about the hundreds of federal scholarships available, see the Barron's book named above or check Federal Aid to Students for Higher Education, put out by the Congressional Legislative Reference Service.
- If you belong to an organization such as the Kiwanis, Elks or Rotary, ask a local official about scholarship funds or special loan funds that may be available to your son. If you belong to the American Legion, inquire at the local post or write for the booklet "Need a Lift?" published by the Scholarship Information Service of the American Legion, Indianapolis 6, Ind.

## and some schools are free

on schools with co-op programs, write for Circular No. 463 of the U.S. Office of Education, U.S. Dept. of Health, Education and Welfare, Washington 25, D. C.

Vacation jobs. Most colleges expect students to earn some of their college expenses during the three-month summer shutdown. By springtime the colleges have long lists of openings: from summer resorts, camps, companies. Industries short on technical personnel seek students for summer work not only because the help is needed, but also because they want to get talented young people oriented with them for possible full-time employment after graduation.

How much can your youngster earn during a summer? A fair guess is \$400. But several Amherst students made \$2,000 each by sealing in Alaska or taking double jobs at home. One lad drove a milk truck mornings, did construction work later.

Scholarships. The money given to worthy students has more than doubled since 1952. Today about one student in five has some scholarship help. At well-endowed private schools like the University of Chicago one student in every three has a scholarship. At state universities the ratio drops to one student in 10. The average scholarship provides \$250 to \$500 a year, but some exceed \$2,000.

At least 20,000 scholarships go begging each year because students, and their parents, don't know about them or don't qualify. The main sources of scholarship money are wealthy well-wishers, corporations, churches, benevolent organizations, unions, state and federal governments. General Motors offers several hundred scholarships a year. New York State offers 4,438.

How can you tell if your youngster could get a scholarship? In general he should meet three requirements.

- He should be bright, preferably in the top quarter of his high-school class. The National Merit Scholarships (which practically put a boy or girl through college) are limited to students in the top five percent of their classes.
- He should have a good record of highschool activities. MIT rejects the A-plus bookworms who cannot lead or work with their fellow humans.

[Continued on page 206]

## What it costs to go to college for a year

THE FIGURES below reveal what it will cost this coming year to attend 43 typical colleges of five different types. These are estimates of total costs and are drawn from statistics just collected by the Life Insurance Agency Management Association. Each figure includes \$300 to cover such extras as clothing, books, grooming, laundry, recreation.

## State-Supported Universities

(Add about \$275 for out-of-state students)

University of Connecticut\$	945
University of South Dakota	974
University of Mississippi	979
	1,008
University of Alabama	1,030
	1,035
University of Massachusetts	1,089
University of Nevada	1,115
University of California	1,160
University of Minnesota	1,160
University of Maine	1,206
Pennsylvania State University	1,270
University of Illinois	1,300
Ohio State University	

#### **Private Coeducational Schools**

Temple University	\$1,500
Southern Methodist University	1,525
Antioch College	
Washington University	1,750
Duke University	
University of Chicago	
Stanford University	
Cornell University	

### Institutes of Technology

Illinois Institute of Technology	\$1,672
Drexel Institute of Technology	
Carnegie Institute of Technology	1,800
Case Institute of Technology	1,950
Stevens Institute of Technology	1,965
California Institute of Technology	2,023
Mass. Institute of Technology	2,177
Rensselaer Polytechnic Institute	2,330

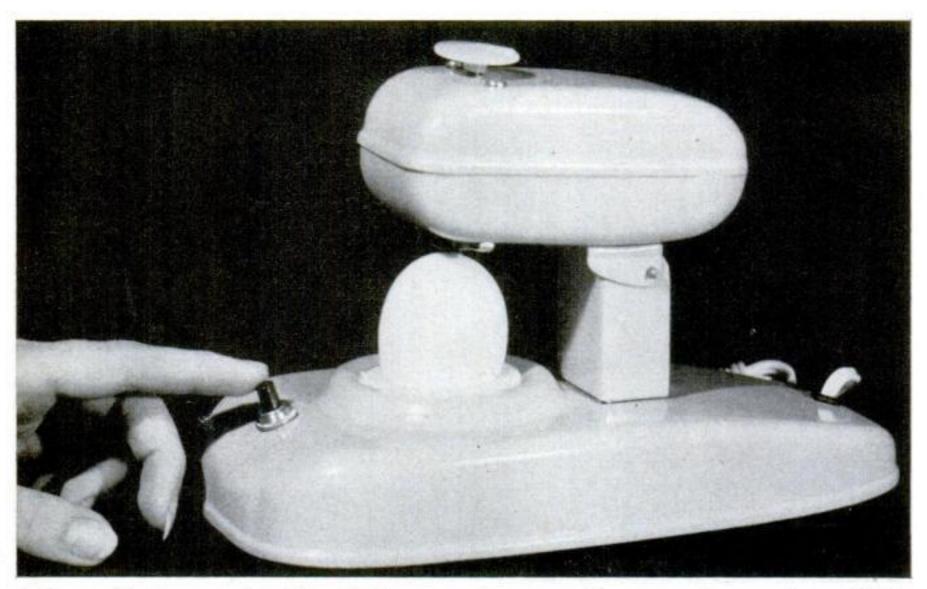
#### Private Men's Colleges

Washington and Lee University	\$1,580
Trinity College	1,830
Williams College	1,935
Notre Dame University	2,070
Princeton University	2,200
Harvard University	2,257
Yale University	2,300

#### **Private Women's Colleges**

Hood College	\$1,994
Wallanlaw Callaga	2,200
Smith College	2,350
Vassar College	2,435
Sweet Briar College	2,500
Bennington College	2,550

# **New Aids to Living**

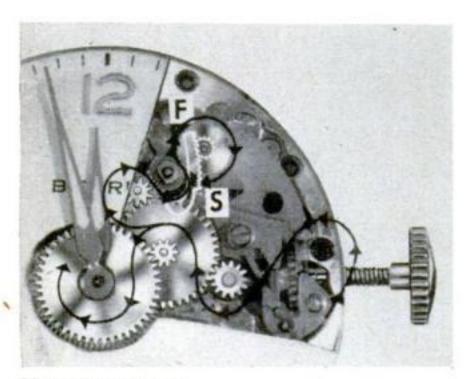


1 Scrambled eggs in the shell may soon appear on breakfast tables. A new electric appliance lets you beat up the whites and the yolks without crack-

ing open the eggs. A curved, needlelike agitator pierces the shell and whirls the contents to homogenize them. After the hole is sealed, you just boil the egg.



**2 Electric portable** plugs into any 115-volt AC outlet to give a hunt-and-peck artist or a speed champ power typing at home. It stands only ½-inch higher than the ordinary portable and weighs only five pounds more. For safety, power is cut off when the cover is raised to clean the type or change the ribbon.

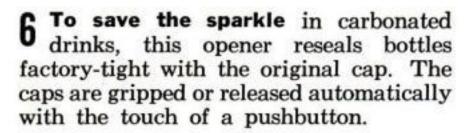


3 Self-regulating watch is speeded up or slowed down by merely setting it to the correct time. It works like the dashboard clocks on some 1957 cars.

A toothed rack on the regulator arm is linked to the hand-setting mechanism through a gear train and a clutch wheel. At left you see what happens when a slow watch is reset. The arrows from stem to large wheel show how the setting gears move the hands. Those from stem to smaller wheel show how the regulator also moves to F (fast). Setting back the hands slows a fast-running watch.



4 Portable barbecue folds to make its own carrying case. After a picnic, the ashes are dumped out and the legs and greasy grill laid in the fire pan. When the table is dropped over the pan, you have a clean, two-inch-thick package.





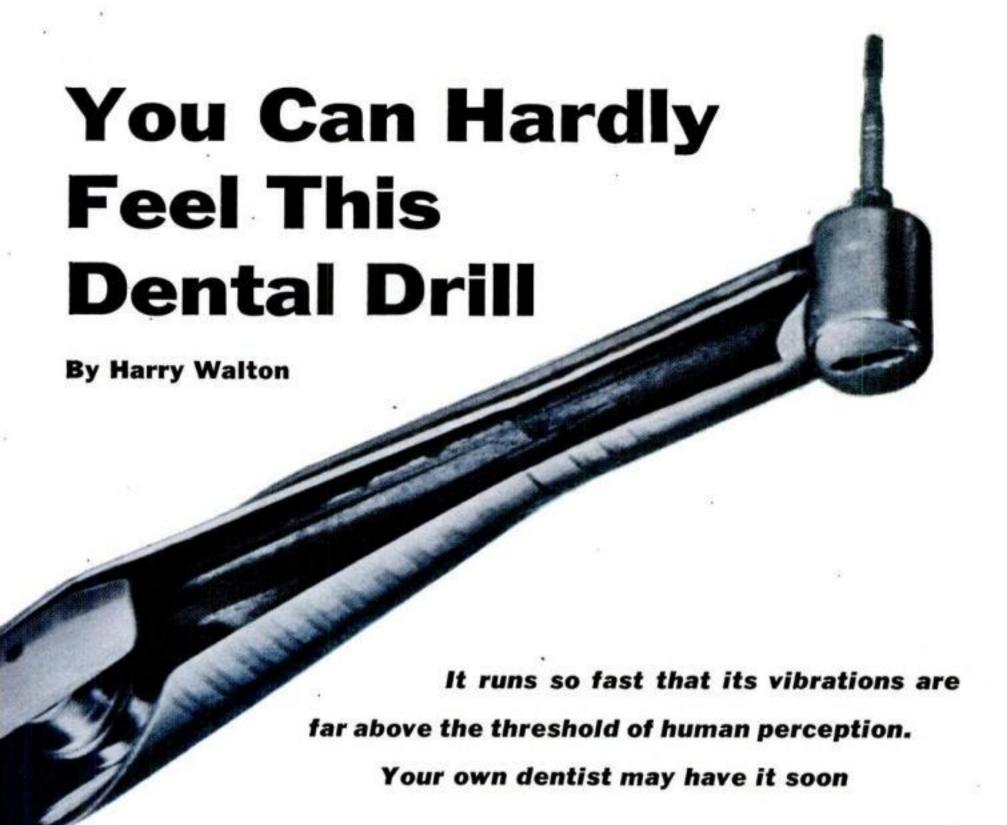
5 Grass won't stick to the blades of a hand, rotary or reel-type mower if they're treated with this repellent spray. The colorless coating is said to cut down cleaning, add rust resistance and prolong the sharpness of the blades.

7 Portable air conditioner weighs 85 pounds and is a slim 13 inches deep. One man can tote the ¾-hp. cooler from living room to bedroom and reinstall it in minutes by tightening two bolts.



More information about the products shown on these pages can be obtained from: 1. M. D. Harper Mach. & Mfg. Co., 3917 Dunbar Ave., Dunbar, W. Va.; 2. Smith-Corona Inc., 330 Fifth Ave., NYC 1; 3. Benrus Watch Co., Inc., 50 W. 44th St., NYC 36; 4. K. G. Niblack Co., 109 Huntington Ave., Buffalo 14; 5. Speco, Inc., 7308 Associate Ave., Cleveland 9; 6. Glen Co., Box 33, Glencoe, Ill.; 7. Sears, Roebuck & Co., 925 S. Homan Ave., Chicago 7.





DENTIST who hates to go to the dentist has done something about the drill nobody likes. By making it run at a fantastic 150,000 revolutions per minute he has given it a magic touch. Usually the patient doesn't even know the drill is at work.

Here's why: At this speed the vibration set up by the cutting teeth of the burr is above human perception. The burr works with a fraction of the pressure necessary at lower speeds, and cuts four to five times as fast. Crown preparation, a procedure that takes about an hour with ordinary equipment, can be done in 15 minutes. Cavities are ready for filling almost before the patient realizes they are being drilled.

The man responsible is Dr. Richard W. Page, a dentist in Chappaqua, N. Y. Since 1955 his high-speed handpiece, as dentists call it, has been pleasantly surprising patients all over the country.

About 4,000 of the new drills are now in use.

Page wasn't the first to look hopefully toward higher drill speeds. The conventional dental engine, little changed since an electric motor replaced its foot pedal or hand crank, turns the burr at 6,000 r.p.m. Some dentists belt the handpiece up to 20,000. A Washington dentist devised a hydraulic turbine to spin at 45,000 r.p.m. But Page went far beyond that, and it's above 100,000 r.p.m. that the tool acquires its magic touch.

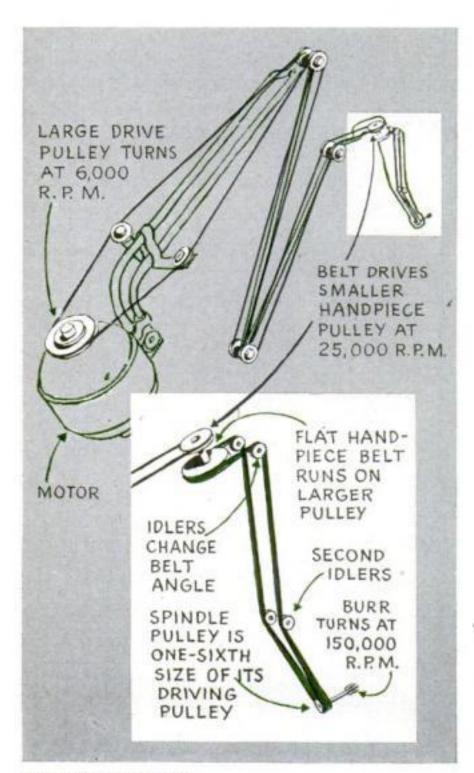
Figures tell the story. Your dentist has to lean on the conventional drill with pressures up to two pounds; he has a callus on the first knuckle of the second finger to show for it. But maximum pressure on the super-speed drill is four ounces; most work is done with no more than a gentle brushing action.

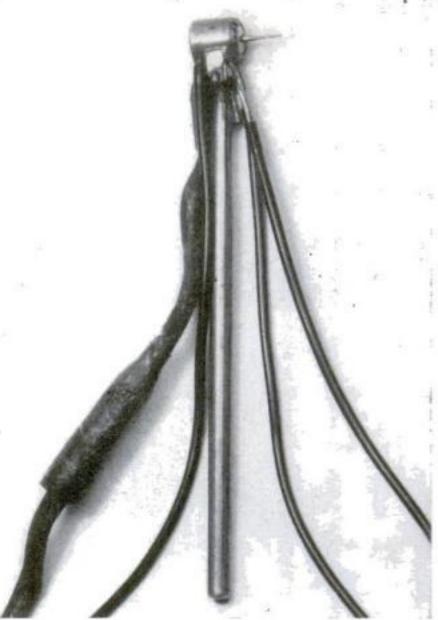
Such light pressure makes both the patient and the dentist less tense. It generates far less heat (a prime cause of pain), reduces the risk of slipping, causes less tooth damage. Some patients who once insisted on anesthetic now do without it.

Like many dentists, Page frankly admits that he is a bad patient himself. "I wouldn't let my own dentist work on me without anesthetic," he confesses. It was his dread of the drill that started his research into higher speeds. At first he pondered using a tiny electric motor to drive the tool.

But an air turbine seemed easier to build. Page made a number of these on a little six-inch lathe in his attic shop, working at odd moments between patients. The tiny rotors—from \(^3\_{16}\) to \(^3/8\) of an inch in diameter—were turned and milled out of brass. Other parts were soft-soldered together. Some of these midget power plants revved up to 200,000.

To learn how they felt, he ground the tops of his own teeth down. Then he tried one of his crude models on a few patients, alternating with a conventional handpiece. The overwhelming response in favor of the





FORERUNNER OF SUCCESS was this air-turbine drill, the first high-speed one Dr. Page used on patients. Bulbous part at left is a silencer.

high-speed drill convinced Page he was on the right track.

But there were discouraging problems. Solid bearings failed above 12,000 r.p.m. Ball bearings overheated, wore out rapidly. Bearing manufacturers preferred not to talk about the extreme speeds Page required. The tiny turbines raced until put to work, then slowed down from lack of torque. They demanded more air than the standard dental compressor could supply. Some patients complained about the roar of the exhaust air.

Page discussed the problem with Herbert Chayes of the Chayes Dental Instrument Corp., of New York. A pioneer in higher speeds, Chayes had a gear-driven handpiece that ran at 25,000. Page tried it on himself, complained that the gears set up a nerve-chattering vibration.

"That's not the answer," he told Chayes. "I'm going to make a belt-driven handpiece."

Page went back to his attic shop and got busy. Changing the drive pulley and cutting out the resistor of a standard dental engine gave him 25,000 r.p.m. at the back of the handpiece.



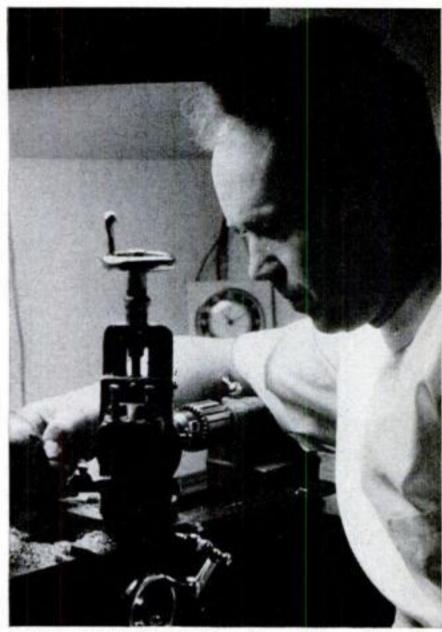
THESE TINY ROTORS drove Page's turbine drills. He switched to belt drive, but the U.S. Navy's dental lab now has developed a turbine drill.

His difficulties started right there. He made model after model, soldering and even taping together parts cut from brass bar and tubing. Trouble with the bearings was overshadowed by grief from the little belt.

His first belts were rubber bands; they broke in seconds. He tried nylon fish line. It held, but the knot that joined the ends set up a jolting chatter. Even so-called endless rubber belts proved to have a thickening at one point that made them useless.

Next, Page crocheted belts from thin nylon line. He was able to join the ends smoothly; the belts worked. But none like them were available commercially. The final answer was a flat belt, manufactured in the form of a sleeve or stocking of rubberized nylon from which individual belts 16-inch wide could be slit. The manufacturer refused the job of slitting, but Page designed a machine to do it.

Although better bearings were now available, makers were still shocked at the speeds Page talked about. Moisture and grinding grit, entering the spindle



ADEPT AT THE LATHE, Dr. Page (above) is also inventor of an air-water jet to ease drilling, and of a revolutionary dental chair he uses.

head, quickly ruined the tiny bearings. A gland or stuffing box seemed necessary to seal them, but no material stood up long around the high-speed spindle.

Finally Page dispensed with the gland, left clearance around the spinning shaft, and fed compressed air in between the bearings. Flowing out around the shaft, the air keeps foreign material from entering.

But what if the air failed for some reason? The answer to that was a pneumatic lock. Air pressure in a tiny cylinder holds a pin away from the handpiece pulley; if the air supply fails, the pin drops into a hole and locks the pulley.

A water jet was next added to spray against the tooth. Along with the air, this acts as a coolant and constantly washes away cutting debris.

One last headache remained. The chuck or burr-holding device usually used was cumbersome. Page needed one that would stay in perfect balance at top speed. Simplicity did it: The answer was a sleeve of rubberized steel mesh which is pushed into the hollow spindle and holds the burr shaft by friction only.

# **500 Feet Underground** Iding a Giant Powerhouse

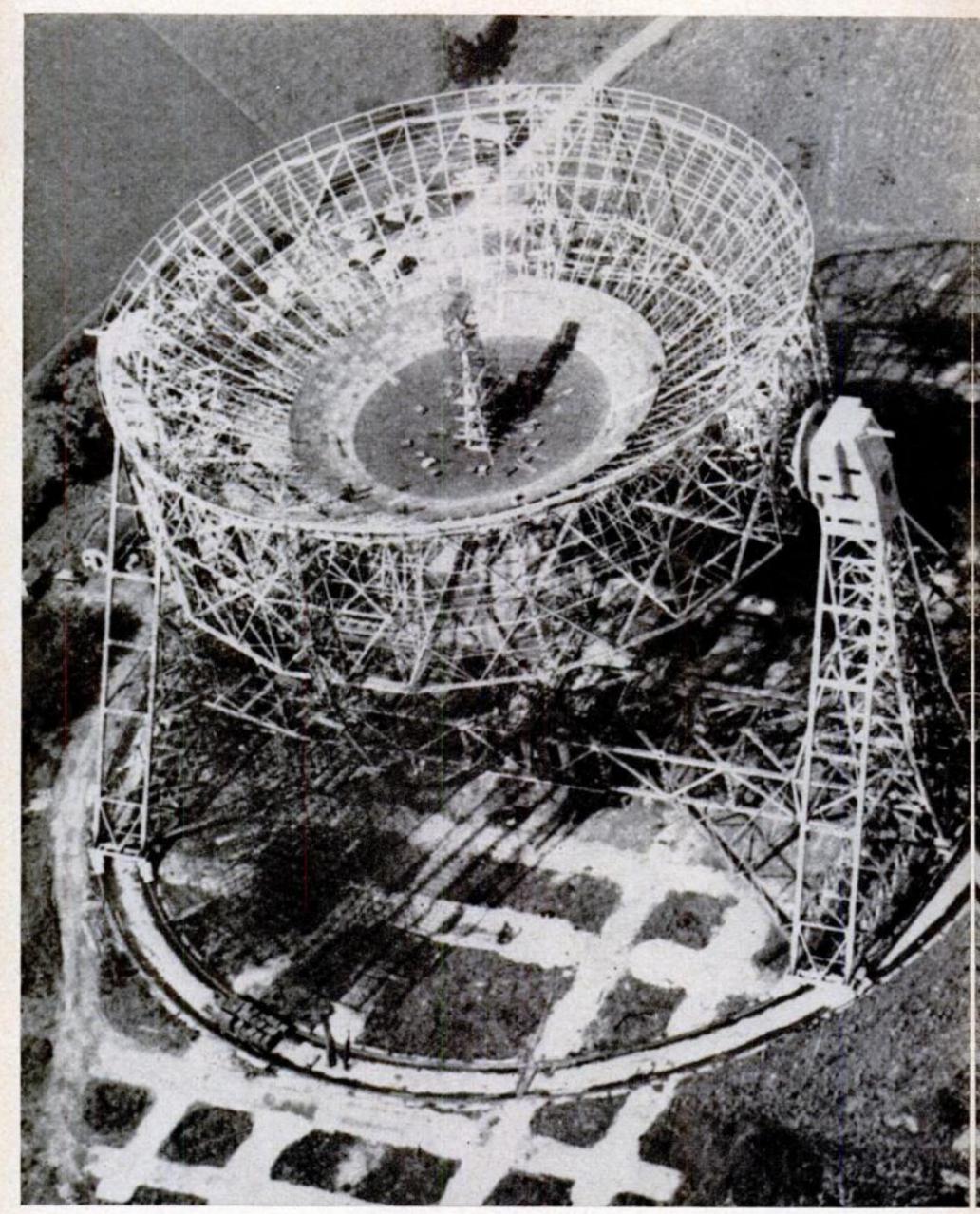
Imagine a 12-story building inside a granite mountain and you'll get an idea of this High Sierra plant

now under construction as part of Pacific Gas of the Kings chamber—56 105 high—will house two huge generators and produce & Electric Company's hydroelectric sysout of solid juice-maker, tem on the North Fork granite, the underground Powerhouse, feet wide, 175 long and mammoth River in California. 128,000 kilowatts. Haas HIS

Water to drive the turbines will come from Wishon Reservoir, over a mile high in the Sierras. Under pressure of 72 tons to the square foot, it will

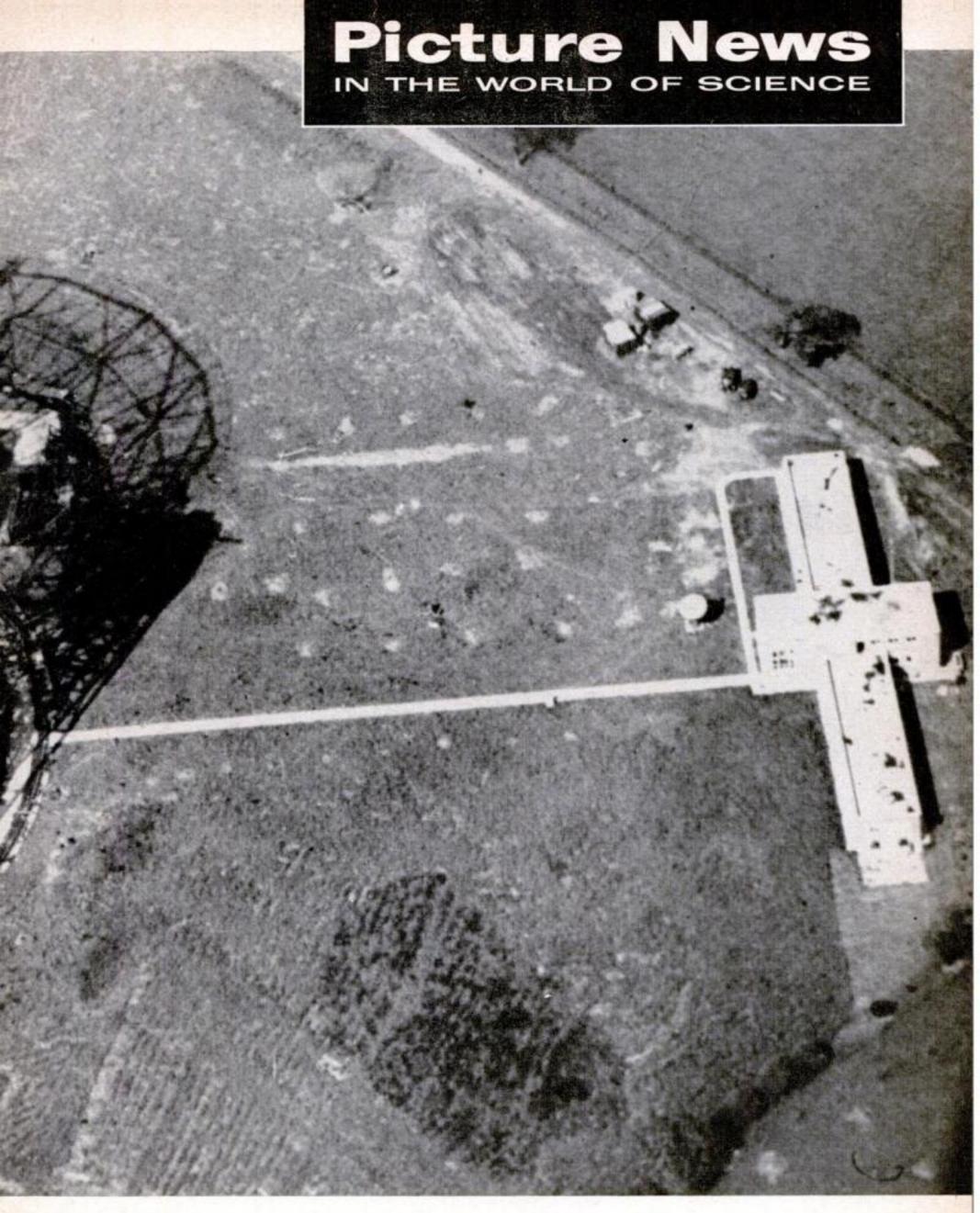
WISHON RESERVOIR (ELEV. 6,550 FT.) hit the turbine Paul

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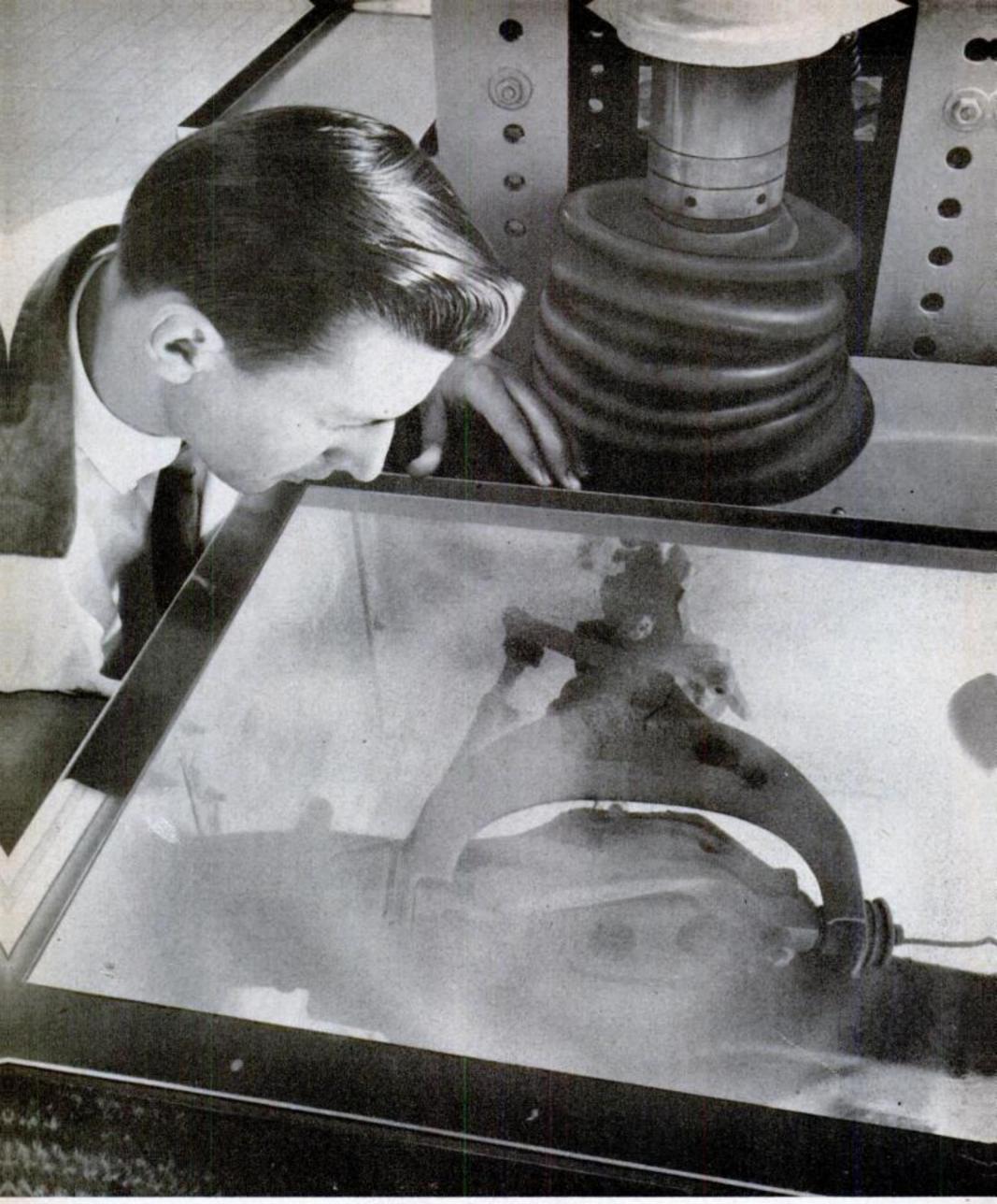


Giant radio telescope will pinpoint any spot in the sky

Largest moving radio telescope in the world and 10 times more powerful than any now in operation, this 250-foot-diameter bowl antenna can rotate on its circular track and swivel between 185-foot towers to follow the stars. Abuilding since 1952 at Manchester University's



Jodrell Bank station, the \$1,400,000 receiver will be ready to measure radio waves in space during the 1957-58 geophysical year. More than 30 tons of copper mesh went into its parabola, which will explore layers of cosmic dust in search of dying stars and stars being born. It will also be used to study meteors, auroras and the sun, moon and planets.



# Captive dust storm torture-tests car suspension

The front suspension in this test box has gone through the equivalent of 2,000,000 desert bumps at 110-degree heat amid fine, whirling dust. (The dust was brought to Chevrolet's Detroit Engineering Center from Arizona.) The test box is one of many devices that put automobile parts through man-made weather—mud, rain, sleet, ice and wind.

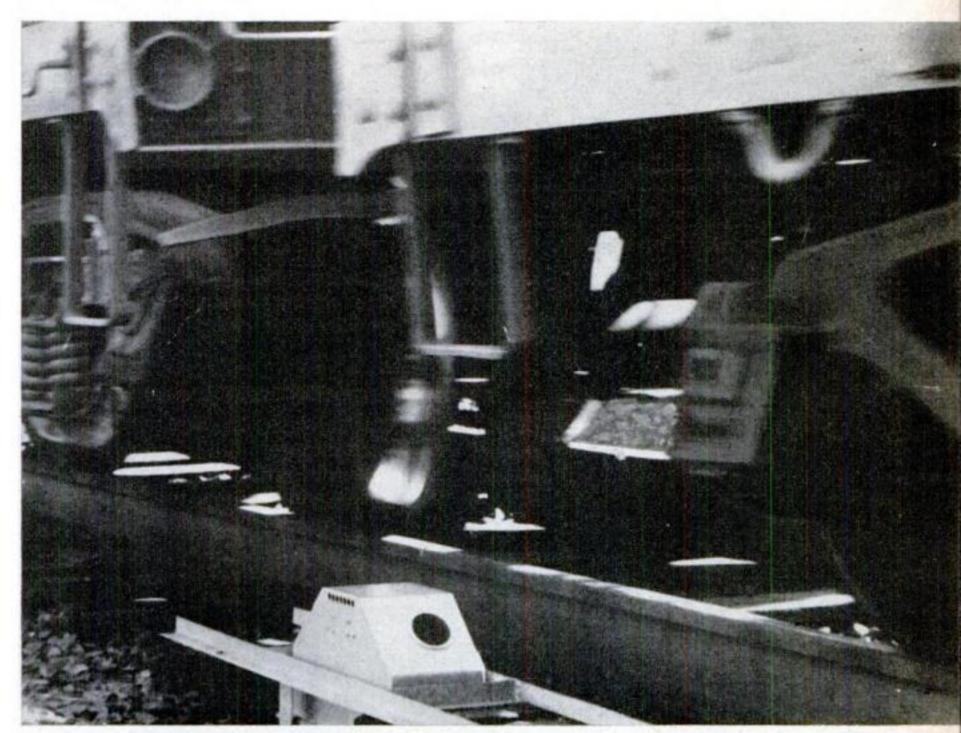
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# PICTURE NEWS



# Taper-shaped asphalt truck is stronger, holds more

Forward taper of the aluminum-jacketed tank of a new asphalt carrier was designed for greater structural strength and cargo capacity. Drivers say that the vehicle is more stable, therefore easier to handle, and that rear visibility is improved. Asphalt drainage on the job also is better, according to the maker, E. D. Etnyre & Co., Oregon, Ill.



# "Private eye" spots hotboxes as trains roll by

AN ELECTRONIC detective is on duty with the Chesapeake & Ohio Railway at Norge, Va. It is an infrared device next to the rails that opens its "eye" as a wheel passes by and checks on the heat of journal boxes. Temperatures are recorded on tape in the station. When the detector indicates an overheated axle unit, the train is stopped.

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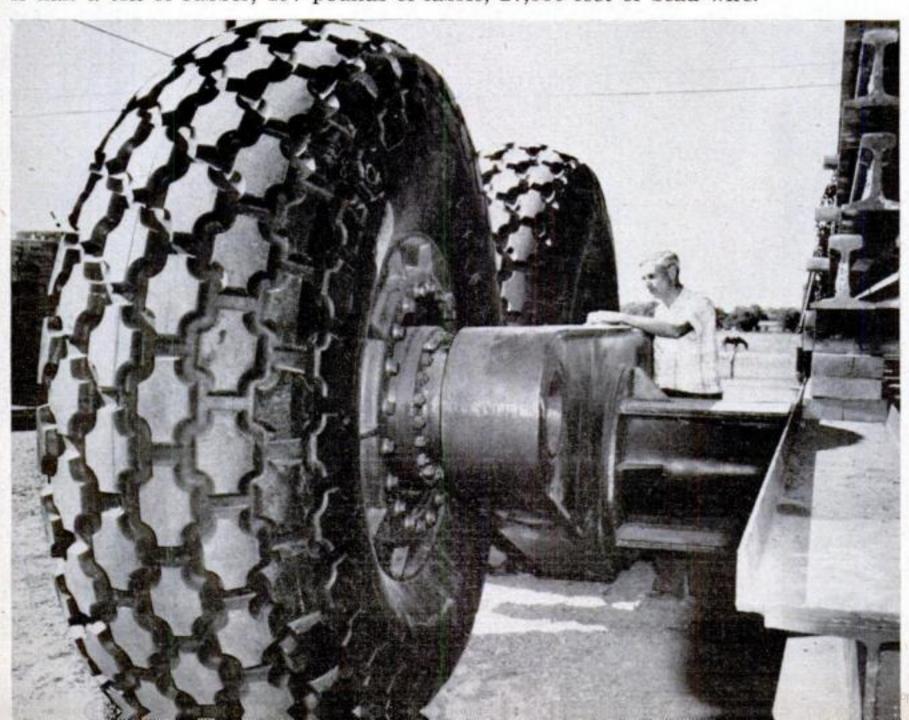


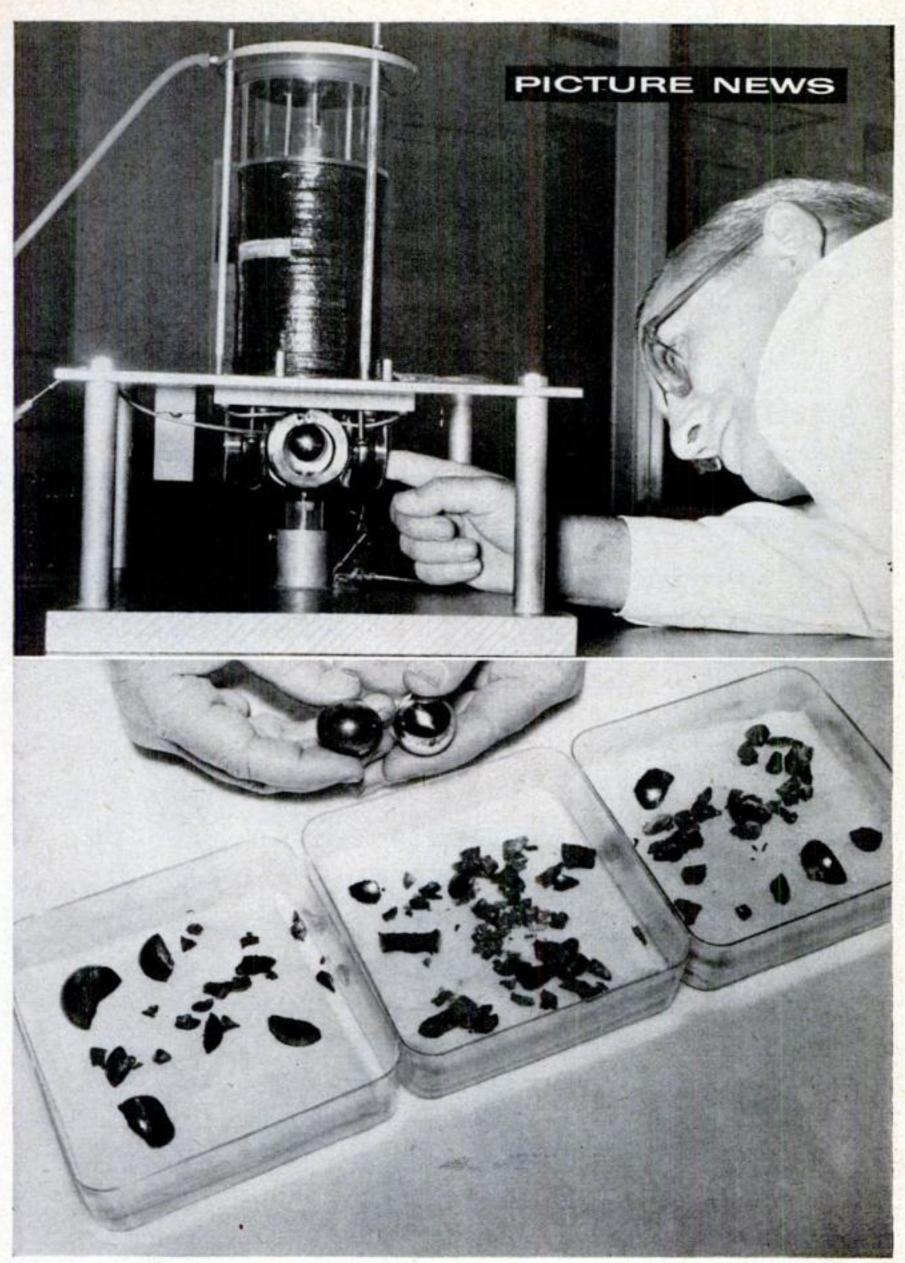
#### He ain't gonna mow no more-but lawn stays green

Mowing the front lawn, watering and weeding got Sherman Z. Lipstein of Omaha, Neb., down. "Why not slap on some concrete and forget it?" he asked himself. One day he did. Here he relaxes on his green-tinted concrete while a neighbor sweats it out behind a mower.

#### Towering tire dwarfs man, weighs a ton and a half

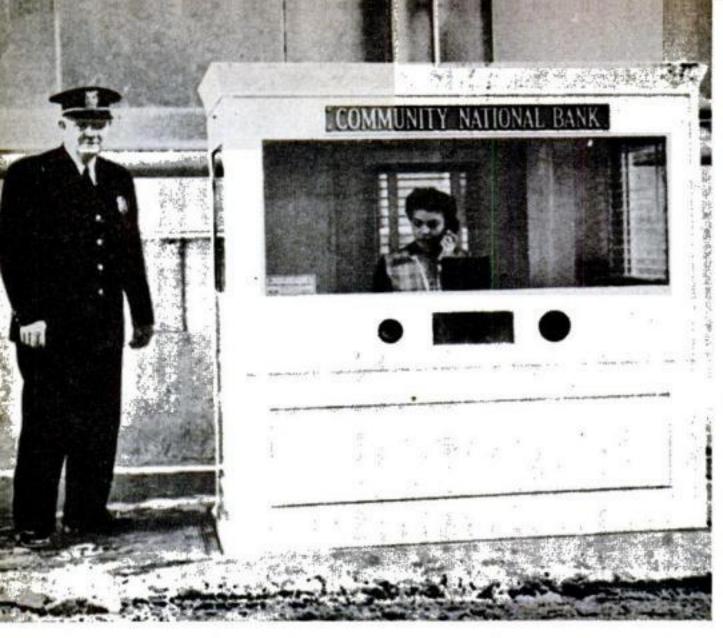
NINE feet high, these monsters are being tested in a New Mexico desert in preparation for their job of moving complete pumping stations over the sands of Saudi Arabia. In each of the 3,000-pound units there is half a ton of rubber, 197 pounds of fabric, 27,000 feet of bead wire.





# Steel balls spin at 700,000 r.p.m. in strength test

A magnetic suspension device that holds one-inch steel balls as they are whirled at 700,000 r.p.m. is used by General Motors to test ball-steel strength for use in future autos. In top photo an engineer points to a ball suspended for a spin. Trays hold bits of three that flew apart.



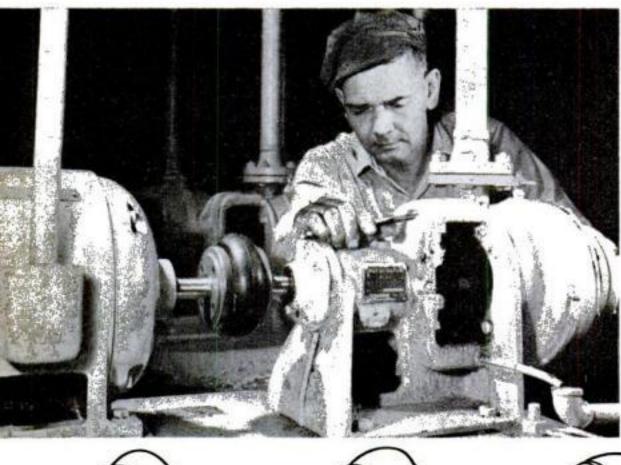


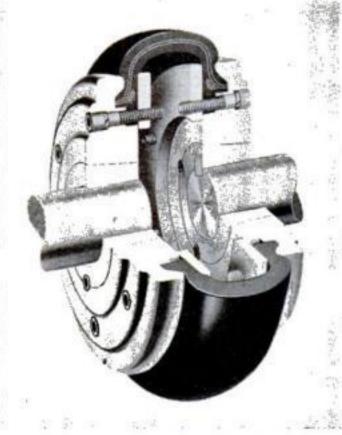
#### Disappearing bank handles cash for motoring public

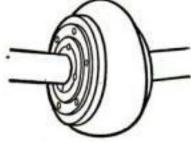
This unusual teller's cage, mounted in a basement elevator shaft, provides the Community National Bank of Pontiac, Mich., with a means of serving customers who want to make deposits and withdrawals with-

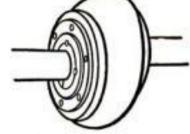
# "Rubber-tire" couples misaligned shafts

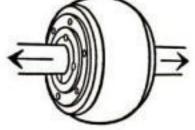
The flexible coupling below is built like a tire casing with a "bead" to clamp in hublike flanges. It handles torsional vibration, shock loads, misalignment and end float. A slit through its rubber and synthetic plies makes it easy to mount or peel off. Dodge Manufacturing Corp., Mishawaka, Ind., makes the coupling in sizes for four to 600-hp. motors.

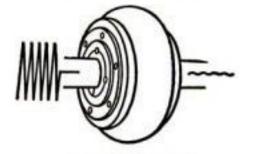












ANGULAR MISALIGNMENT PARALLEL MISALIGNMENT

END FLOAT

TORSIONAL VIBRATION



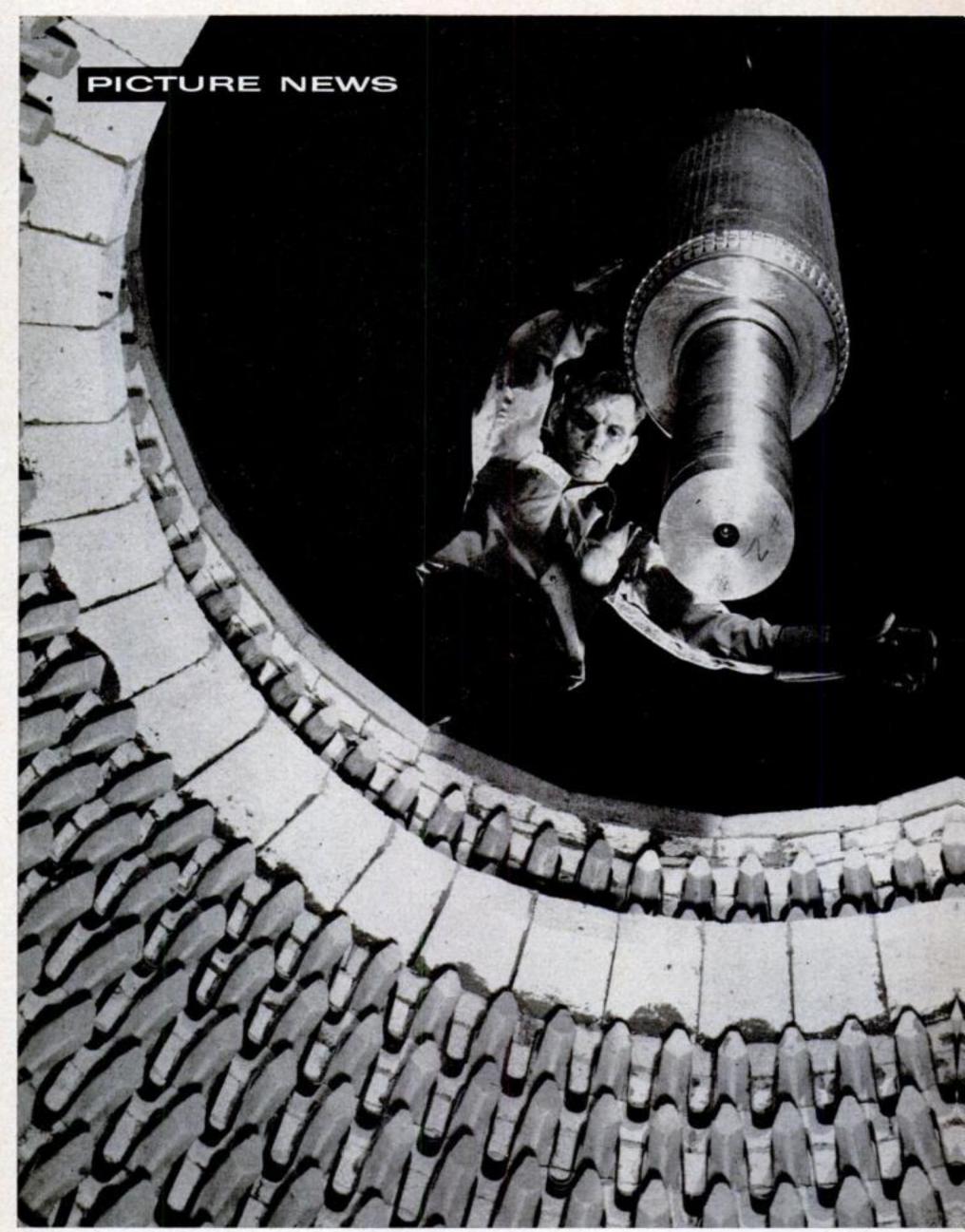


out leaving their cars. During banking hours the cage stands neatly on the sidewalk by the side of the curb. At the close of day, the teller simply pushes a button and descends—cage, receipts and all—to the basement below, and the top of the cage becomes a slab in the pavement.

# Sun's rays operate Army's newest helmet radio

A solar battery in daylight and a nickel-cadmium storage battery at night power this version of the Army's helmet transmitter-receiver. The daytime silicon cells trap enough light both to run the radio and recharge the storage unit. A converter steps up power from 4.5 to 50 volts. The Signal Corps plans to try the setup with other light radios.

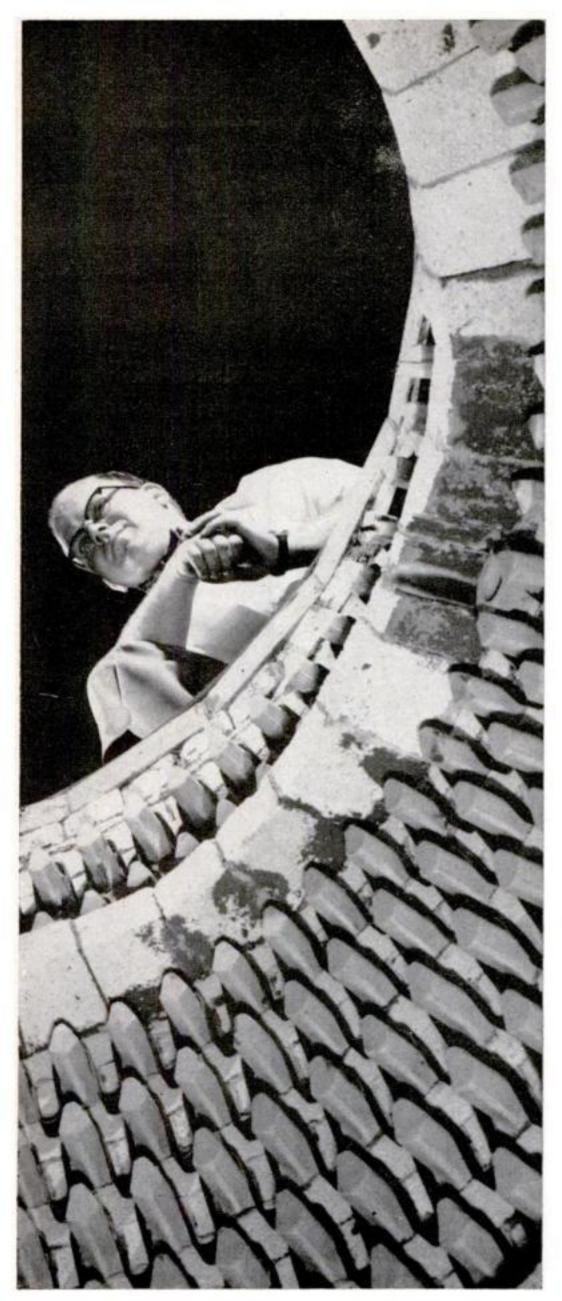




# Huge pit furnace "cans" motors for atomic reactors

HEAT that would almost burn a diamond is generated in this furnace, which General Motors uses to "can" motors and

motor elements for use in atomic reactors. When the one-ton rotor shown here has been lowered into place and the heat



turned on, a metal cylinder will be shrunk-fit around it. The tight fit is necessary for operation at high temperatures and pressures in radioactive water.



#### Phone fits on bedside table

A NEW, smaller telephone set leaves room on even a small table for an electric clock and other nighttime accessories. The redesigned phone, now being tested by Bell, comes in a variety of colors.

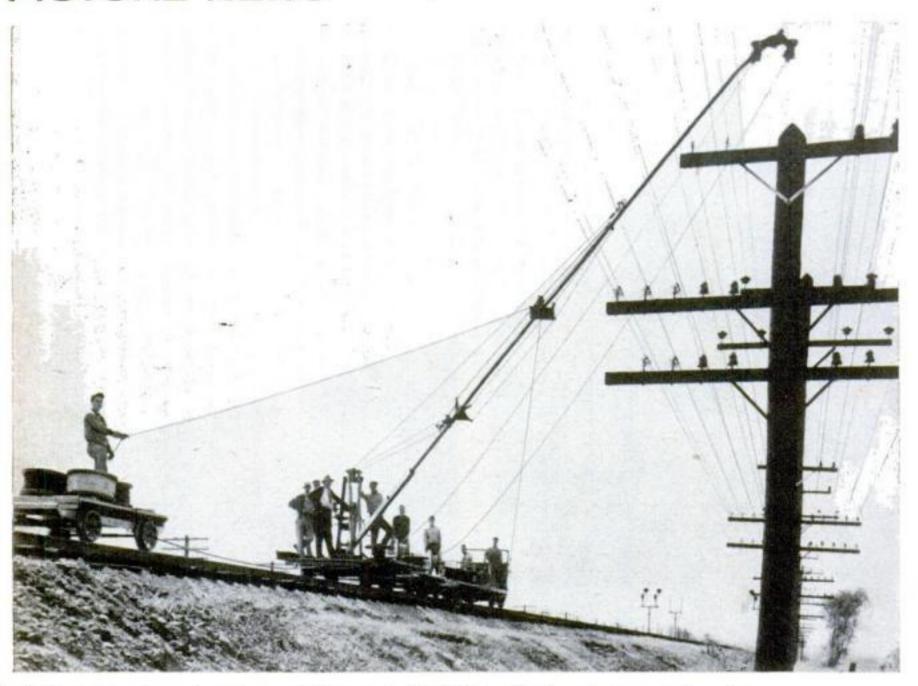
# Delivery van rides a scooter

A LIGHT, three-wheeled pickup truck has been built around the Italian Vespa scooter. Less than nine feet long, it seats two in front, hauls a payload of 770 pounds and goes 40 m.p.h. Price: \$989.



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#### PICTURE NEWS



#### Telescoping boom strings 1,000 feet of wire a minute

Handling two lines at the same time, this wire stringer, invented by a signal supervisor, saved the New York Central \$50,000 on a 360-mile job. Its telescoping boom can reach 51 feet, maximum distance from tracks to crossarms on the poles. Best record: 186,000 feet strung in three hours.

# Army's new turret truck fights fires at close range

This aluminum truck sprays water from its turret to fight fires inaccessible to an ordinary pumper. It has four-wheel drive and can climb a 60-percent grade. Loaded with 1,000 gallons of water and 150 gallons of foam, it will protect Army bases from the tropics to the arctic.

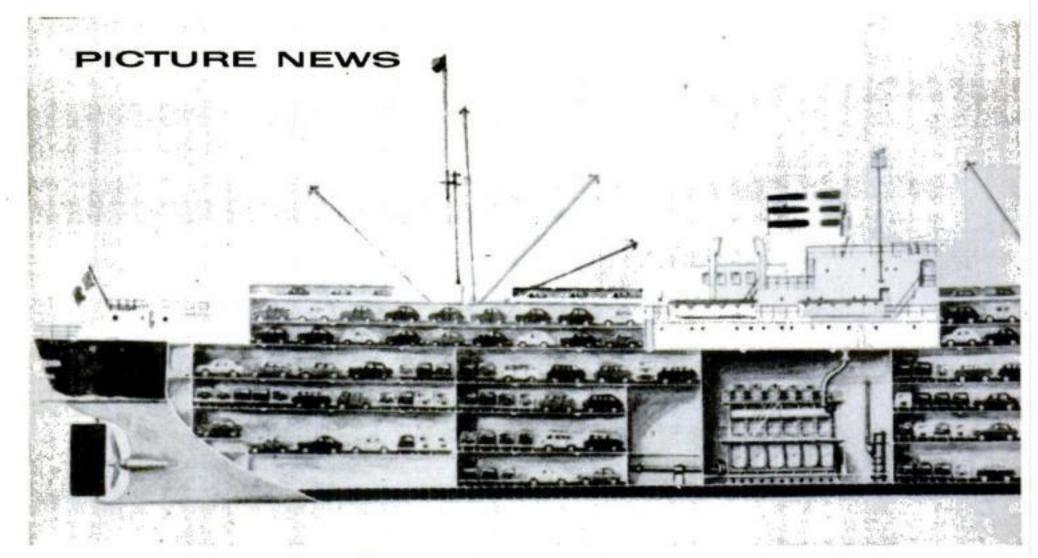




#### Pushbutton clothesrack delivers suit to customer

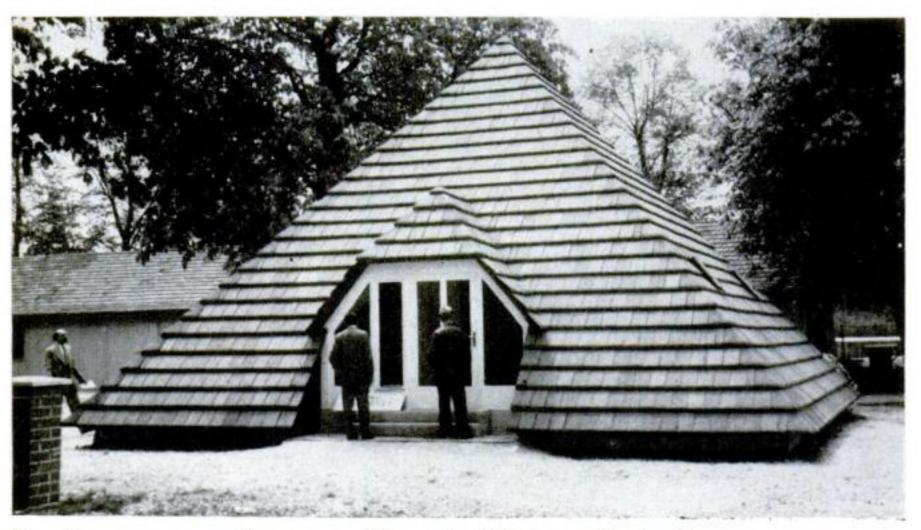
A TURN of a dial and press of a toggle switch brings a customer's suit within arm's reach at this dry-cleaning establishment on New York's Fourth Avenue. Hung in a notch corresponding with the claim-check number, the suit rides the conveyor rail for delivery without waiting. The system is made by Flow-Master Machine Corp., Brooklyn.

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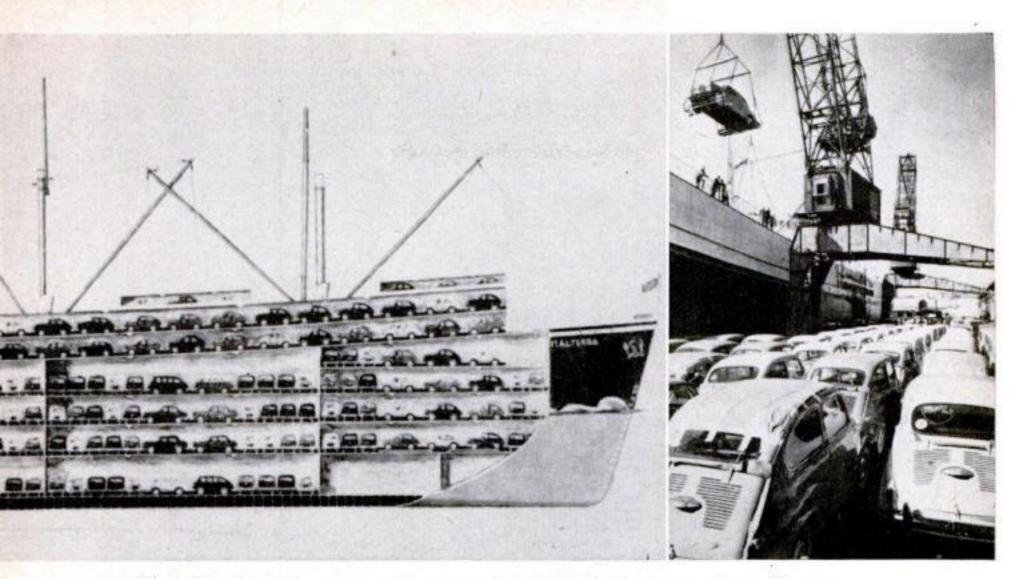
# Oceangoing "garage" hauls Italian cars to U. S.

A cargo of 1,000 uncrated cars can be carried in the hold of the Italterra, a 10,000-ton Liberty ship converted by Fiat, the big Italian automobile maker, into a floating garage. The cutaway above shows how all available ship space is used for storing cars. The vessel, powered



# Roof serves as home until rest of house is built

STARTING at the top, a Munich, Germany, builder offers a pyramidalroof house for immediate occupancy by low-income families until they can afford to complete a home. When the rest of the house is eventually bought, the builder raises the roof and sets it in its proper place. Connecting the two is included in the purchase price.



by Fiat diesel engines, recently completed its first voyage from Savona, Italy, to Los Angeles and San Francisco in a bid for the low-priced, foreign-car market in this country. At right is a lineup of the small Fiat "600" and "1100" models, which are loaded and unloaded at terminal docksides by cranes through the ship's hatches.



# Electronic eye lights up speed-warning sign

The automobile safety record at Portsmouth (N. H.) Air Force Base has improved since this warning device was erected. Radar waves are bounced back from an approaching car to a control box that computes the speed at which the car is traveling. If the driver is exceeding a set speed limit, the neon sign automatically lights up.

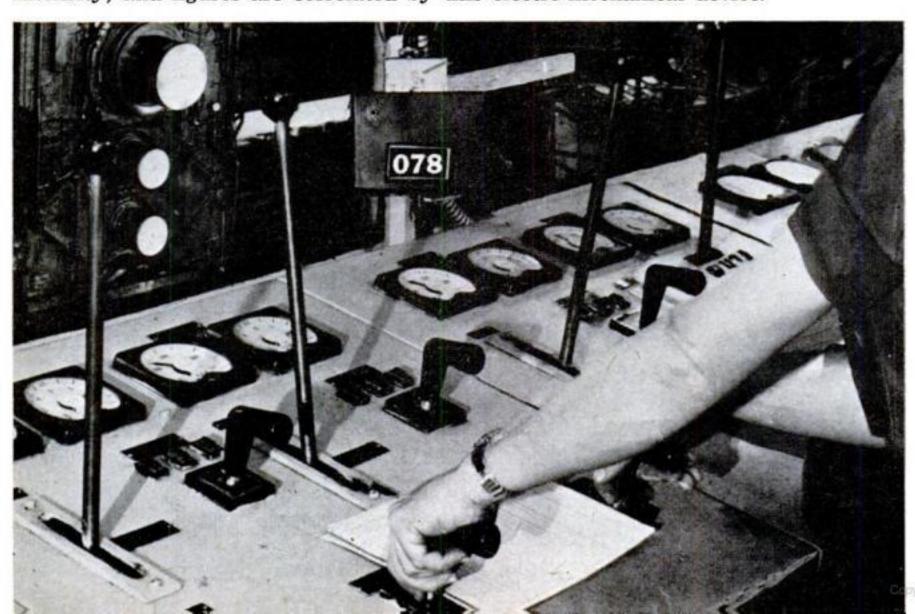


#### Closed-circuit TV polices New York subway station

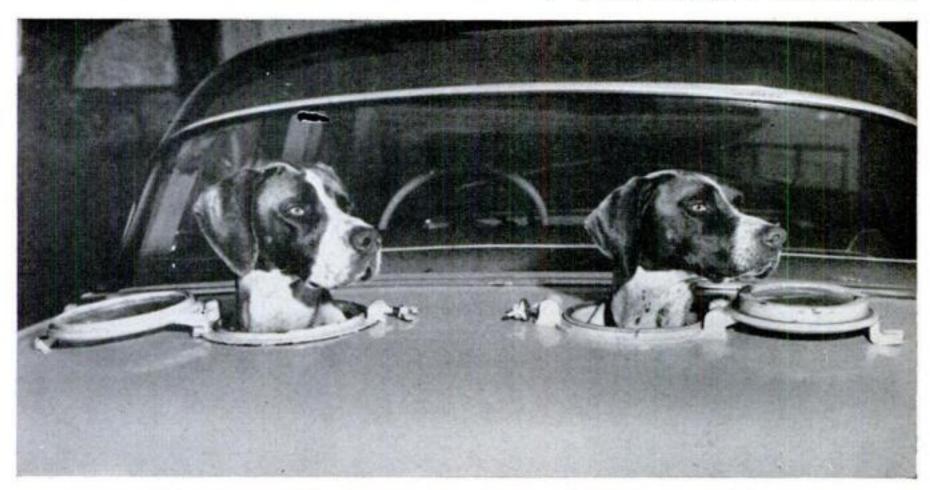
In a test setup of closed-circuit television, New York subway authorities are attempting to find out if one man can keep an eye on what's going on in various spots of a station platform. Here an attendant watches an entrance and exit on a monitor screen in his booth.

# Gauge measures thickness while steel is being rolled

A GLANCE at the dial tells speed-control operators at U. S. Steel's Fairless works the thickness, in thousandths of an inch, of the steel strip being rolled. X rays, beamed through the steel, are measured for intensity; and figures are correlated by this electro-mechanical device.

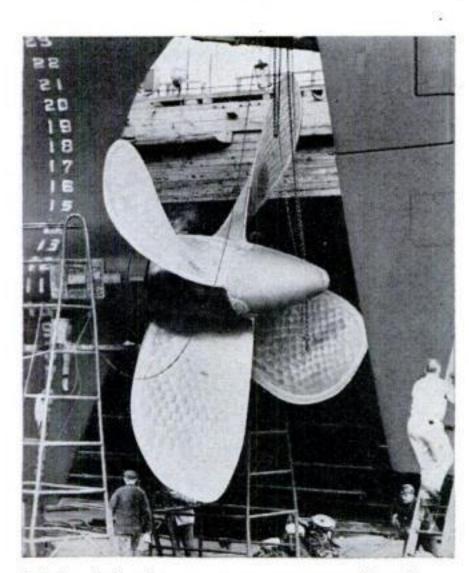


# PICTURE NEWS



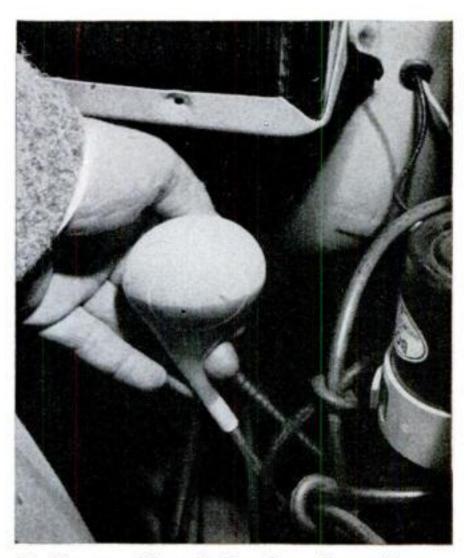
# Portholes in trunk deck provide lookout for pups

No danger now of his pet pointers romping into his lap while he's driving. E. D. Todd of Victoria, B. C., built portholes in the rear deck and locks the two dogs in the trunk. The openings, which can be closed in a rain, let in light and air, and give the dogs a view of passing scenery.



#### Thin-blade screw saves fuel

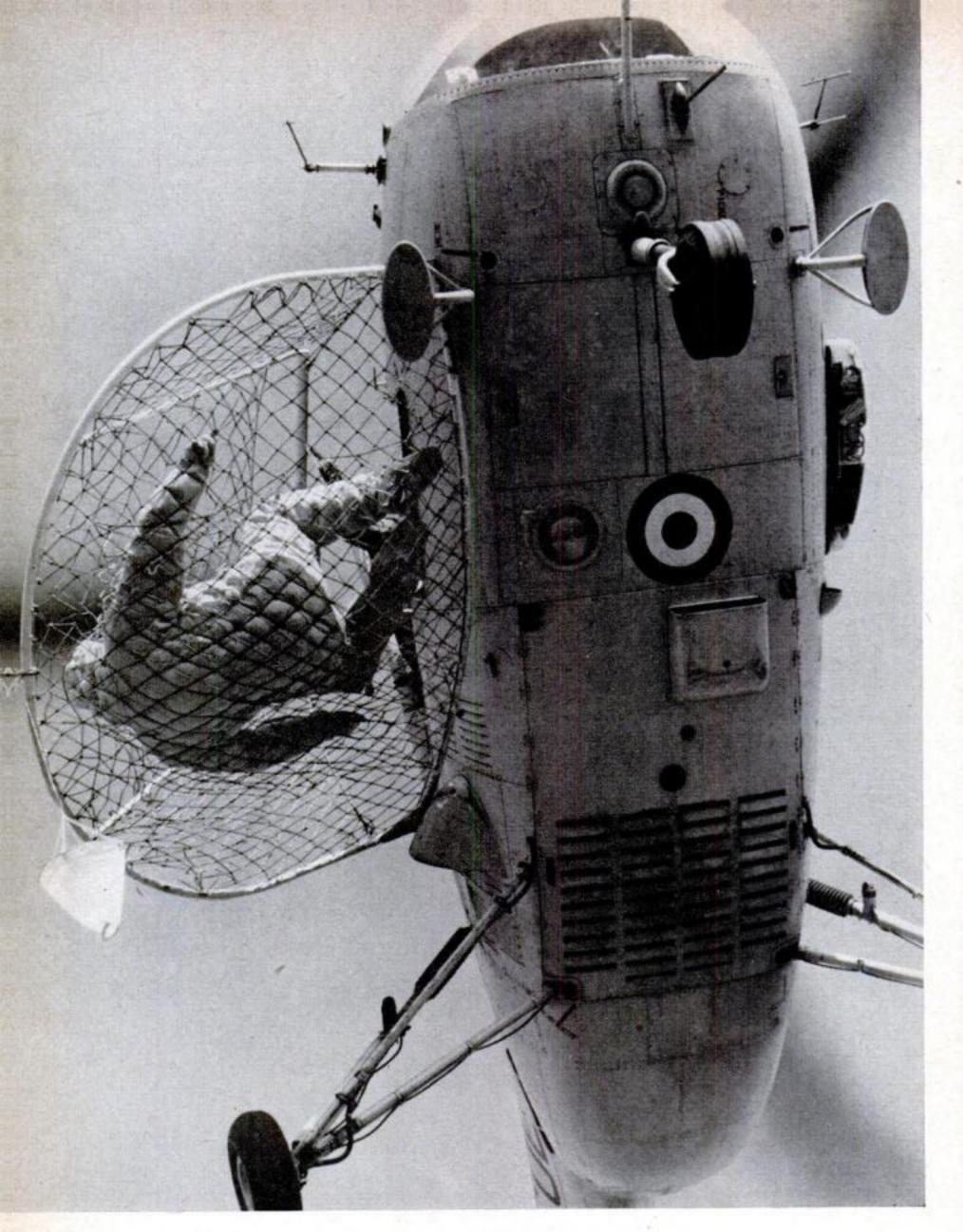
NIALITE has been substituted for manganese bronze in a new propeller fitted here on the SS President Adams. The alloy is lighter, stronger, and, in this design by Baldwin-Lima-Hamilton Corp., permits thinner blades for less drag.



#### **Bulb on dipstick checks oil**

This German dipstick checks oil level without withdrawal from the crankcase and messy drippings. Pressure on the transparent bulb brings oil up through a tube for a sight reading. When no oil shows, replacement oil should be added.

AUGUST 1957 [2]



# Trawl net scoops up survivors in air-sea rescue

Tests by an RAF search-and-rescue squadron off the British coast provided this unusual photo of a "survivor" scooped from the sea. The net is a light, small version developed by Bristol Aircraft and the squadron for helicopter rescue of injured. When stowed it is folded against the side of the craft. The wind sock at left aids directional stability.

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# The Edsel Story ... So Far

THE brand-new Edsel, which trumpet flourishes and drum rolls will announce to the world in a few weeks, is already nine years old. That's how far back—1948—Ford Motor Co. began the process of adding a new name to the list of American autos. How come it takes so long to put a new car on the road? Take a look at the logbook:

Sept. 28, 1948: Henry Ford II sells the idea of an "intermediate" car to the Forward Product Planning Committee. One compelling argument: The company is losing customers for medium-priced automobiles. If the owner of a Ford wants to trade up to a more expensive car, he has just one choice—Mercury. Only 26 percent take it. Compare that with the competition. When Chevy owners trade up, 87 percent buy Pontiac, Olds or Buick; when Plymouth owners trade up, 47 percent stick with a Chrysler product.

1949: The project gets underway, aiming for a 1951 or 1952 model.

1950-51: The Korean War puts Edsel on the shelf.

1952: Henry the Second dusts off the Edsel once more.

July 7, 1954: Stylists begin dreaming and engineers plot "package size" (interior and exterior dimensions). Dick Krafve gets into the act. Assistant general manager of Lincoln-Mercury, he is to advance to general manager of the Edsel Div. and a Ford v. p.

April, 1955: Engineering signals change to provide four Edsel series from two body shells (Ford and Merc). The first idea had been to develop all four lines from a single shell.

July, 1955: Engineers start structural design.

August 16, 1955: Stylists finish, and the 1958 model is locked up—as far as looks go (minor changes will still be made). The next day the Big Brass inspects the mockups, applauds spontaneously—a most unusual reaction from sophisticated auto executives.

Late 1955: Ford invests \$100,000 in "motivation" research by three universities (Columbia, Michigan, Chicago) to find a selling strategy. The bulgedomes' formula: Aim for "spirited but responsible adventurers . . . young executive or professional families on the way up . . ."

January, 1956: Most special tooling has by now been ordered. Orders for engines, transmissions, axles, bumper bars, sheet metal are placed. The name Edsel is decided on (the choice is hardly a surprise to anyone, but public announcement is still 11 months away).

February, 1956: Assembly facilities are allocated.

March, 1956: Wooden pattern models are turned over to the toolmakers.

December, 1956: Small items—upholstery, hardware—are ordered.

April, 1957: Eight completed Edsels roll off the line at the Mahwah, N. J., plant, to test assembly facilities.

May, 1957: The designers wash their hands of the '58 model. But Krafve continues to fuss with it: He changes the molding around the back-up lights, moves the radio antenna from rear to front.

July 15, 1957: Production begins.

September, 1957: The '58 Edsel goes on sale.

January, 1958: By this date sales figures will have set the pattern and Krafve will know if he has a winner. His biggest worry: the Edsel's trend-bucking design, reminiscent of Ford cars of the Thirties. Ford people like it, unanimously. But will you?—James C. Jones.

Next Month in PS: Pictures and Facts About the New Edsel



Cruising at close to 90 miles an hour behind the three-pointed Mercedes emblem, we could still

# 1,000 Miles on Europe's

PS reporting team drives the full length of a German Autobahn to compare this pioneer expressway with America's super-roads

By Frank Harvey, with photos by W. W. Morris







Mercedes gulps luggage at Salzburg, lower corner of map below.

# Superhighway

HERE in the world, outside of the U.S.A., can you tromp down hard on the gas pedal and not let up for hundreds of miles? Nowhere—except on Germany's famed Autobahn.

To find out how it stacks up against U. S. turnpikes,



POPULAR SCIENCE sent Bill Morris and me over to drive it.

We started from Salzburg, an ancient Austrian resort city overtowered by the Alpine crags on Germany's southeastern border. From here it is 1,000 miles by Autobahn to the northern port city of Hamburg, our destination. The Mercedes people had lent us a handsome 220 sedan all shined, greased, gassed, tuned and insured.

Despite the Autobahn's age (it was started in 1933) the German superhighway is impressive. It's shrewdly graded for safety at high speed, bypasses towns, goes in for long straightaways and has two lanes each way with

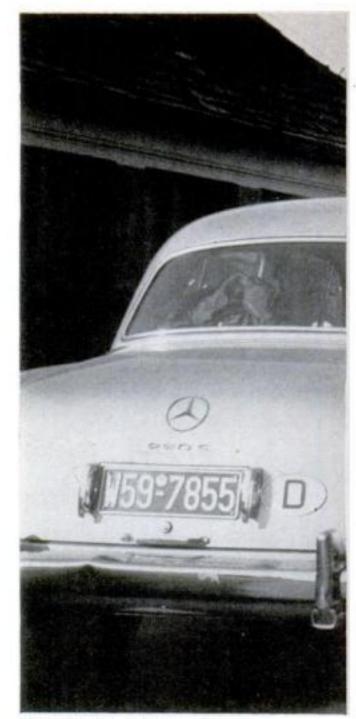
a grass island divider.

**Speed limit?** There isn't any! And the Germans make the most of it—they drive as though racing to save an uninsured home from fire.

We tooled along on the Autobahn at about 140 kilometers (87 miles) per hour. The Mercedes, built like a light tank, is tight and sound as a nut. It has a swing-axle rear suspension that tends to give the car a slight swivel-hip motion on uneven surfaces—but it smooths out bumps like magic.

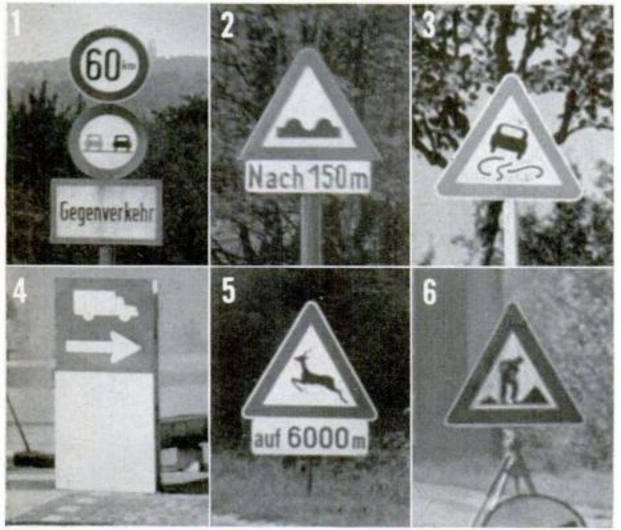
If you were set down on the Autobahn without knowing what country it was in you might think you were someplace on the Pennsylvania Turnpike. Hills and fields are the same; the industrial Ruhr smoke looks the same as smoke coming out of stacks around Steelton, Pa.

But here's what you miss. Gas stations on the German super-road are far apart and there's a painful shortage of places to eat and sleep. You don't appreciate a good American motel until you drive out one of the Aus-

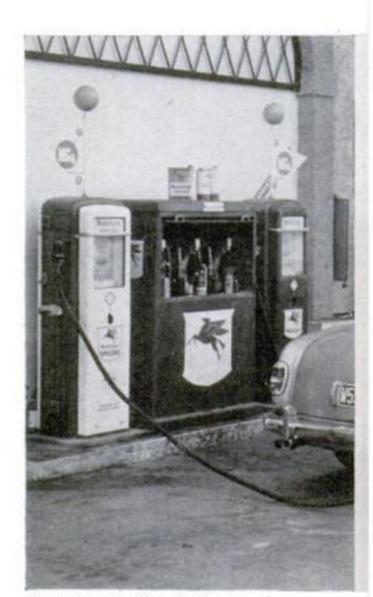


This isn't a toll station but

# Can you read these pictorial warning signs?



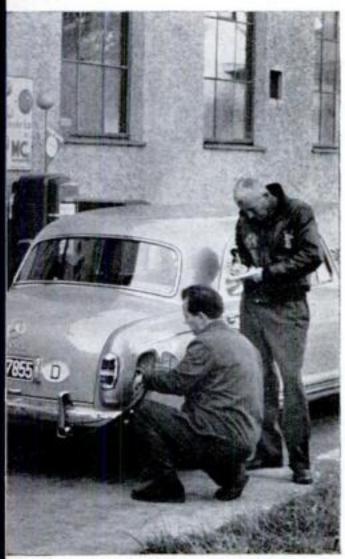
European traffic signs are designed to bypass language barriers. Those above mean: I. 60-Kilometer Speed Limit, No Passing (left car is painted red); 2. Bump in 150 Meters (sign is known among GIs as a "Marilyn Monroe"); 3. Slippery Road; 4. Truck Turnoff; 5. Deer Crossing for 6,000 Meters; 6. Men at Work.



sparing appetite for fuel made us even fonder of the "Mercy 220." She delivered



the border crossing between Austria and Germany. Our papers got a quick and painless check.



23 miles per gallon at a cruising speed of 85 miles an hour, purring like a cat.



BIKE AND MOTORBIKE RIDERS fill up chinks in town traffic like mortar in a brick wall. They seem to have a remarkable capacity for survival—and to need every bit of it as they dart around.

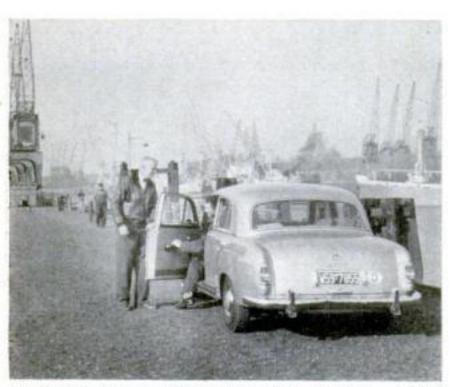
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POLIZEI MEANS COPS. German police cover an accident with tape measure and notebook, try to fix blame on spot. It shortens court hassles.



TRAFFIC OFFICER in a German city is like the starter in a stock-car race. Once he signals, all you see is a blur and a cloud of blue smoke. German cops use a different system from ours. Sometimes they don't beckon, but just turn sideways—that's your cue to come on through.



AT HAMBURG DOCKS we ended our trip—1,000 Autobahn miles from soaring peaks of Austria to the smog of Germany's great industrial port.

fahrts (exits) late on a rainy night in search of food and lodging. We tried it north of Cologne, worming our way through madhouse traffic along the Rhine.

City streets are a frightening contrast to the open highway. The general impression you get is of having left the pits and entered a mammoth stock-car race. Cars zip past only inches away. Old men and young girls pedal along on bikes, shockingly vulnerable in the avalanche of whizzing machinery. What the guy ahead of you may do is anybody's guess. When he's ready to turn he flips out a hinged luminous pointer. Our GIs call this a "machts nichts stick." Machts nichts translates as "doesn't mean a thing."

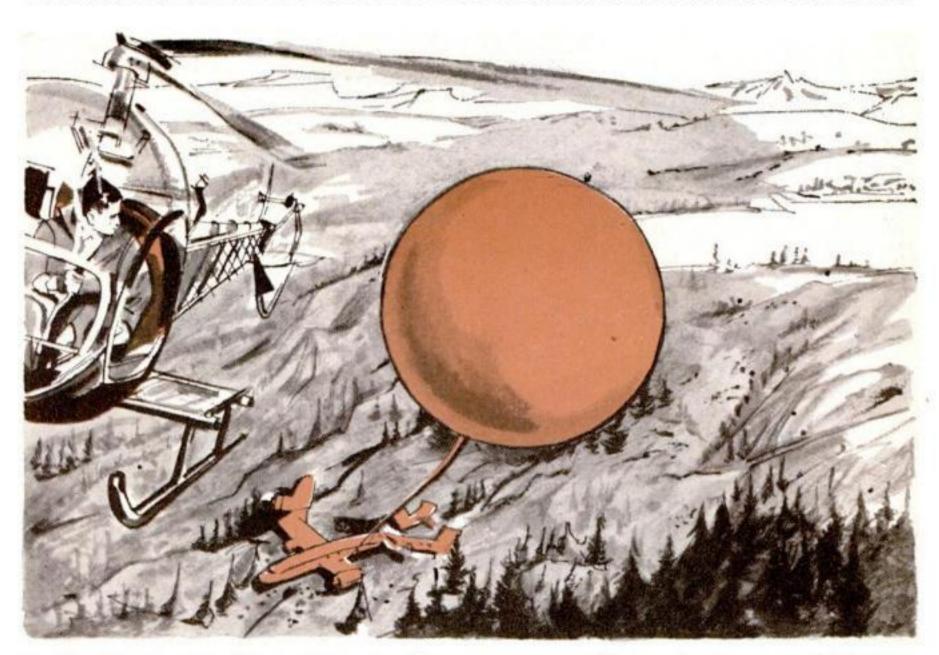
But when you finally arrive at a Gasthaus, it's almost worth fighting city traffic for. In a good one the Wienerschnitzel is crisp, the rooms immaculate, the beds covered with huge eiderdown quilts, and the bathtubs only slightly smaller than a Hollywood swimming pool. You can almost dive into a German tub—but don't push that row of buttons carelessly.

I took a bath in the pre-dawn one morning and, unable to find the light switch, simply pressed all the buttons I could feel in the dark. Nothing happened. I got into the tub and was lying, half asleep, in the deep water when the door opened and a young fraulein walked in. I said, "Nein! Nein! Go away!" She placed a towel on the edge of the tub, turned on a light (by pulling a string) in the corner, smiled at me and left.

It's relatively easy to get back on the Autobahn once you've left it. Signs are plentiful. But it is not a good road for full-bore driving after dark. It doesn't have the orderly row of stakes marked with firefly reflectors that tell American drivers the contour of the road ahead. About 50 is the top safe speed.

The Autobahn is still sending out new tentacles all over West Germany. Like the original sections, now undergoing constant repair after 24 years' hard use, the new ones will lack the broad shoulders and some of the fancier features of U. S. turnpikes. But Germany's superhighway has no tolls, no billboards—and no speed limit. Let's face it; every man has a hidden urge to lay the buggy whip to the horses. On the Autobahn you can do it without peering anxiously into the rearview mirror.

# New Ideas from the Inventors

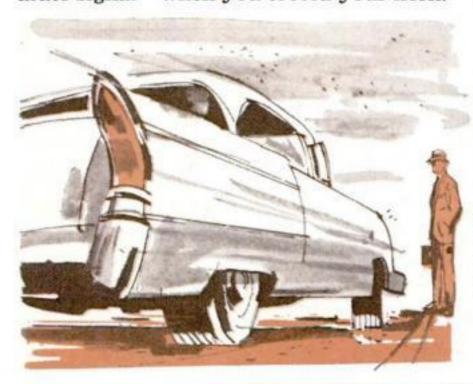


1 Marker Speeds Plane Rescues. Survivors of an air crash might get help faster if their plane carried this automatic signal. Triggered by sudden deceleration,

a gas cartridge and ejector would inflate and release a balloon. Unreeled to the end of its tether, the marker would guide search-and-rescue craft to the spot.

2 Horn Light Warns Car Behind. If a pedestrian or driver doesn't hear you sound your horn, you sometimes have to make a sudden stop. This switch adapter would alert the driver in the car behind you by flashing your brake light—or a separate signal—when you tooted your horn.

3 Watch Tells Time and Weather. With this combination wrist watch, thermometer and barometer giving up-to-theminute reports on temperature and pressure changes, a sportsman could carry his own little weather station right on his wrist and fit his plans to conditions ahead.





Please turn the page for more new ideas

# More Inventors' Ideas



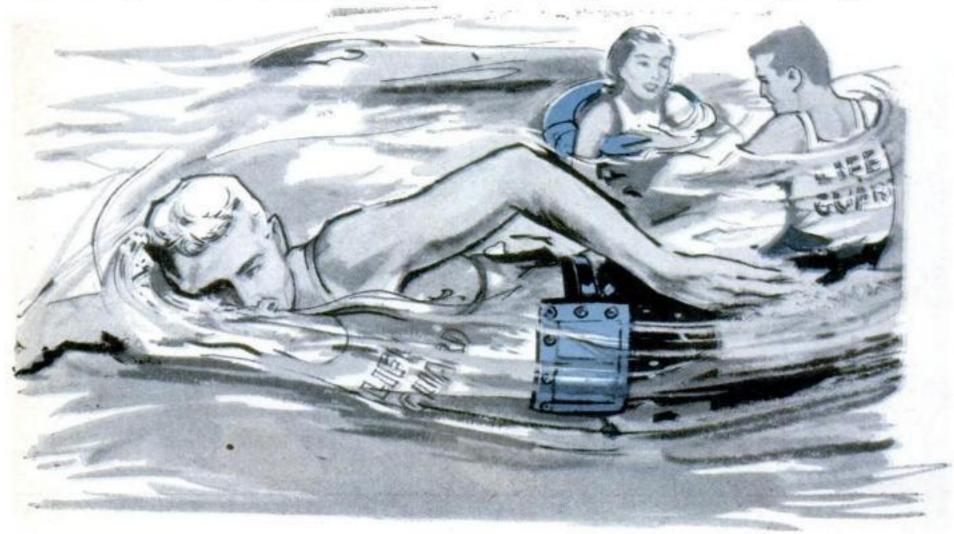
4 Car Seat Doubles as Sleeper. Traveling youngsters—and their parents—might ride more comfortably with this convertible chair and bassinet. Hooked over a seat back, it would safely hold a sitting or napping child. Lifted out of the car, it would serve as a handy sleeper on family visits or overnight trips.

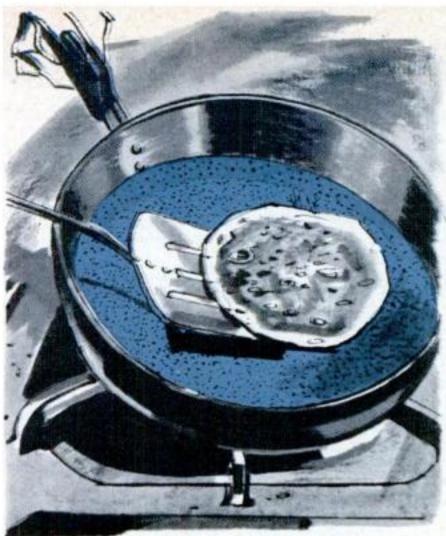
7 Inflatable Belt Aids Lifeguard. Folded into a belt pouch, this buoyant ring wouldn't interfere with a lifeguard's effort to reach a swimmer in distress. A pull



5 Chain Dunks Drinks for Cooling. With a chain like this in your fishing boat, you could let canned or bottled refreshments cool off in the water while you warmed up in the sun. Formed like figure-eights, rubber grippers hooked to the chain would push down over the necks of standard beverage cans or bottles.

cord would release—and inflate—two semicircular tubes. Hooks and cords on the tubes might be used by the lifeguard for towing, or to form a single ring.

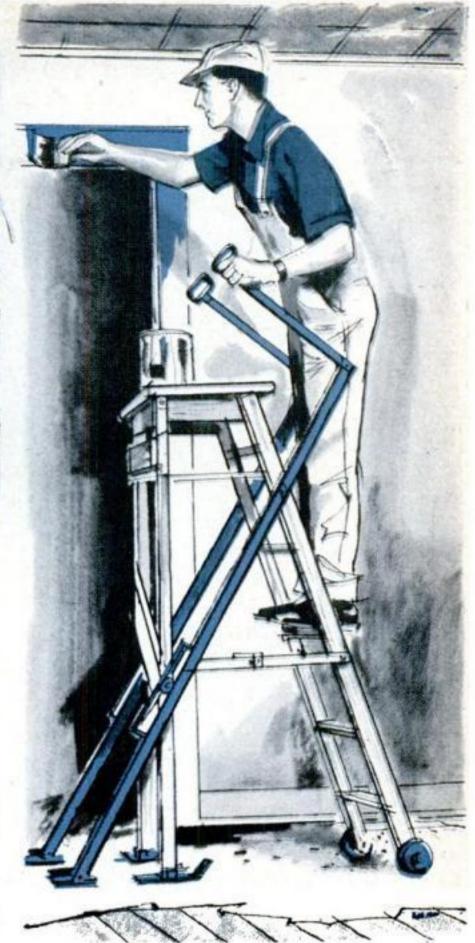




6 Griddle Bottom Rations Grease. According to this GM patent, porous metals similar to those used in permanently lubricated bearings could make a supply of cooking fat last a long time. Heat would cause a thin film to rise to the surface of this grease-impregnated griddle, and keep food particles from sticking.

Wented Rest Cools Your Back. With a tube and air scoop plugged into this honeycombed seat cushion, car breezes could be routed to cool your back on sticky summer drives. The air scoop would be clipped to the ventilating wing, so you could regulate the amount of air flow by adjusting the window angle.





9 Ladder Walks You Along. Most ladder jobs would go faster if you could follow the work without climbing down. The front legs of this walking platform would be fitted with wheels, and the rear ones with runners. To move it, you would manipulate a pair of pivoted pushers.

The following patents have been issued on these inventions:

1. Patent No. 2,778,332 to Thomas W. Talbot, Santa Monica, Calij.; 2. No. 2,696,598 to Francis J. Lozowski, Utica, N. Y.;

3. No. 2,763,122 to John M. Hayes, Chicago; 4. No. 2,730,163 to Morris Goldberg, Waban, Mass.; 5. No. 2,781,959 to Wallace W. Loveland, Newport, Minn.; 6. No. 2,765,728 to George C. Pearce, Dayton, Ohio; 7. No. 2,753,574 to Louis Wolshin, Hialeah, Fla.; 8. No. 2,758,532 to Raymond H. Awe, Battle Creek, Mich.; 9. No. 2,775,488 to Claude O. Wingrove, Tucumcari, N. M.

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D.C., at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.

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Gus Gets His



# Signals Switched

Did Tony Coskey's negligence cause the crash? Or had the brakes of Fenton Smith's limousine failed? Paging Gus Wilson!



#### By Martin Bunn

HEN Gus Wilson and his helper in the Model Garage, Stan Hicks, heard the crash, they rushed out into the street. An amazing sight met their eyes. The long-snouted limousine of Fenton Smith, a wealthy and somewhat irritable financier, had rammed into the rear of Tony Coskey's pickup truck. The impact had caused an assortment of fruits and vegetables to erupt from Tony's vehicle. Melons, tomatoes, grapefruit, oranges and cabbages rolled about under the feet of gathering spectators.

Smith's chauffeur, Bill Sullivan, a burly ex-Army sergeant, sat behind the wheel of the limousine with a stunned expression on his face. Fenton Smith, a thin lath of a man with the predatory features of an eagle, had his head out the window, engaging in heated discussion with Tony. Officer Jerry Corcoran was just arriving on the scene.

"You clumsy ox!" Smith said. "A man isn't safe with you driving that junk pile about. You didn't signal your stop. I'll sue you for damages."

Tony, a squat little man who supported his family by peddling vegetables, looked up at Smith in astonishment.

"But, Mr. Smith," he protested, "you can't sue me. I didn't run into you. You ran into me."

Gus ran his expert eye over the points of impact between the two vehicles, noting that the only damage to Tony's truck was a broken tail light, while the Smith limousine had its very expensive radiator grille smashed beyond repair.

"That grille," Smith declared, getting down to look at it, "will cost a pretty penny to replace. Officer Corcoran, since this fellow stopped abruptly without signaling, he's at fault. He should be arrested for reckless driving."

AT FIRST glance it seemed ridiculous that the testy financier should blame Tony for the crash, since his car had struck the truck. It was entirely possible that Tony's stop light hadn't been functioning. If so, and if Tony had failed to signal his stop with his hand, Smith might be able to make his charges stick. Since Tony's stop light was now smashed, the answer to the question of fault seemed to lie with Bill Sullivan. Jerry Corcoran's eyes turned questioningly to the chauffeur.

"It wasn't Tony's fault, Officer," Sullivan said,

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breaking his stunned silence. "His stop light flashed. I wouldn't have hit him if my brakes hadn't failed."

"Brakes failed!" Smith roared, glaring suspiciously at Sullivan. "Rubbish. I don't believe it."

Jerry Corcoran inquired softly, "And why should you think your own chauffeur would lie about the accident?"

Bystanders glanced knowingly at one another, for there wasn't a person present who didn't know that Tony Coskey had served in the Army under Bill Sullivan, and the two were fast friends. It could well be that Sullivan was taking the blame for the crash on his own square shoulders to spare his friend.

"YOU'LL do well to remember who pays your salary, Sullivan," Smith said angrily. "Covering up for this fellow will only get you fired."

"Sorry, sir," Sullivan said firmly. "The brakes failed."

"Check these brakes, Wilson," Smith ordered.

Gus got in the limousine, drove it back and forth, applying the brakes. The firm resistance of the brake pedal, the instant response, told Gus that, at the moment anyway, there was nothing wrong with the brakes.

"They seem to be all right now," Gus said, "but—"

"Don't give me any buts, Wilson," Smith interrupted. "Check the brakes thoroughly. If there's nothing wrong with them I'll get a new chauffeur and Tony Coskey can pay the bill for the repairs on my car."

Sullivan said, "But I tell you, sir-"

"We've heard enough from you, Sullivan, for one day," Smith said, "Get on with it, Wilson."

As Gus drove the car into the Model Garage he could see Tony Coskey bustling about, gathering up his fruits and vegetables. From the miserable expression on his face, Gus knew that the little man realized a new grille for Smith's limousine would cost him more than he could hope to make in a month.

Gus had never liked working on Fenton Smith's car while the owner was around. The eccentric bachelor was inclined to look over his shoulder, complaining, issuing orders. Now, Gus found, Smith was even more suspicious than usual, undoubtedly feeling that all hands were against him to get Tony Coskey off the hook. Smith watched every move Gus made as he worked on the brakes.

Perhaps, Gus thought, the hydraulic fluid was low in the master cylinder, admitting air into the system to cause brake failure. The air might escape to restore brake action when the brake pedal was pumped. He checked the master-cylinder fluid level through the inspection hole in the floorboard.

Finding plenty of fluid, he thought of a cocked and frozen wheel-cylinder piston, then dropped the idea. This would lock only one brake. Ample hydraulic fluid seemed to rule out hydraulic-fluid leaks, but to make sure Gus inspected the system for leaks. There were none. The brake pedal lacked that springy, spongy feel that would indicate weak hydraulic hoses. Under pressure, bad hoses could swell to increase the fluid capacity of the system, and so delay the brake action. Gus inspected the hoses themselves as a double check. Everything seemed to be in good working order.

"DRIVE the car back and forth while I watch it, Stan," Gus told his helper. "Step on it hard, so I can see if brake action is even."

Stan drove the big car back and forth on the garage floor.

"Enough of this, Wilson," Smith said impatiently. "Any man can see that these brakes are all right. Sullivan lied."

"Your brakes seem to be all right," Gus said thoughtfully, "but your stop lights aren't working. They didn't flash on when Stan used the brakes."

"Not working!" Smith exclaimed. "Fix them then—I'm in a hurry."

"Just a moment," Gus said. He dropped onto a creeper to slide under the car, emerging almost at once, to remove the red lenses from the stop lights. Inspection proved that the bulbs were sound.

"We'll road-test her," Gus said.

"With the stop lights out?" Smith protested. "Fix them first."

Gus smiled disarmingly. "A road test may show why they don't burn. I'll signal my stops by hand."

Smith got in the back seat. His eyes came to rest on his chauffeur, up front with Gus, and a look of suspicion came over his face. "You come back here with me, Sullivan," he ordered. "I'll have no

conniving between you two."

Gus drove slowly through traffic. At the first stop he signaled with his hand, but his eyes moved to the ammeter. From the rear, Sullivan noticed this and a puzzled expression came into his eyes. Gus drove out to a country road at the edge of town, speeded up, began to apply the brakes intermittently.

"Is this necessary when testing stop lights, Wilson?" Smith demanded. "Anyway, you can't see them from where you

sit."

"I can tell if they go on by watching

the ammeter," Gus explained. "I'm testing the brakes now."

"Brakes!" Smith rose in his seat like a hooked salmon. "You said the brakes were all right, Wilson."

"I said that they seemed to be all right," Gus reminded him. "Now my theory is that—whoops!"

As GUS hit the brake pedal it plunked suddenly to the floor without effect. The big car careened on without hindrance. Gus brought it to a stop

with the emergency brake, leaped out to wriggle beneath it. He came out immediately, shaking one hand with a pained expression.

"What's the matter with you now, Wilson?" Smith demanded.

"Burned my hand a bit," Gus said. "I found that stop-light switch a bit warm when I checked it in the garage, but it sure is sizzling now. No wonder your brakes failed, Sullivan."

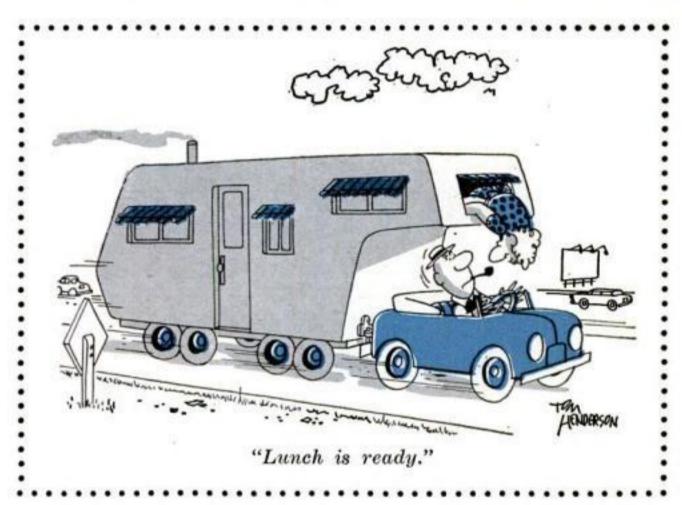
"What has a stop-light switch to do with my brakes?" Smith asked sarcastically.

"Plenty, in this case," Gus explained. 
"This stop-light switch is located on the end of the master brake cylinder, and is operated by hydraulic fluid pressure. It's shorted out. When Sullivan drove in heavy traffic, using his brakes often, the shorted switch got so hot that it caused

the fluid to boil. Boiling fluid will create gas in the brake lines, which has the same effect as air in the lines, bringing about brake failure.

"When I found the switch warm in the shop and then saw that the stop lights weren't burning, even though the bulbs were sound, I figured a dead-shorted switch. Some inferior grades of brake fluid have low boiling points—in fact, some states have passed laws setting up minimum specifications for the fluid. I'd better check and see what kind of brake fluid Sullivan has been using."

"But you said that the brakes were



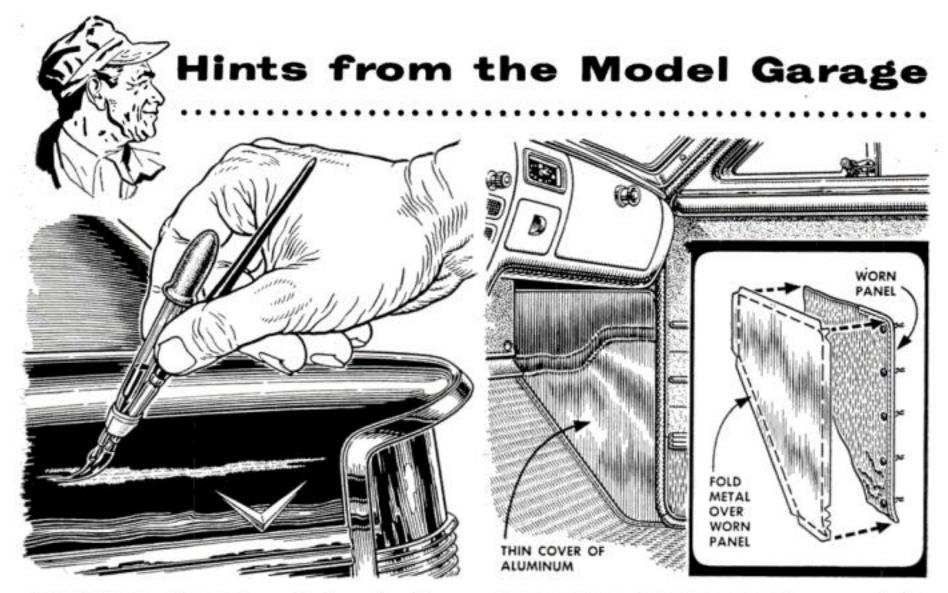
working when you tested them in the street," Smith said.

"Brake-fluid gas will condense again as it cools," Gus said, "and the brakes will work normally again. I didn't check your brakes, Mr. Smith, until quite some time after the accident occurred. I'll install a new stop-light switch to correct your trouble. Now about Tony Coskey's tail light. I'm sure—"

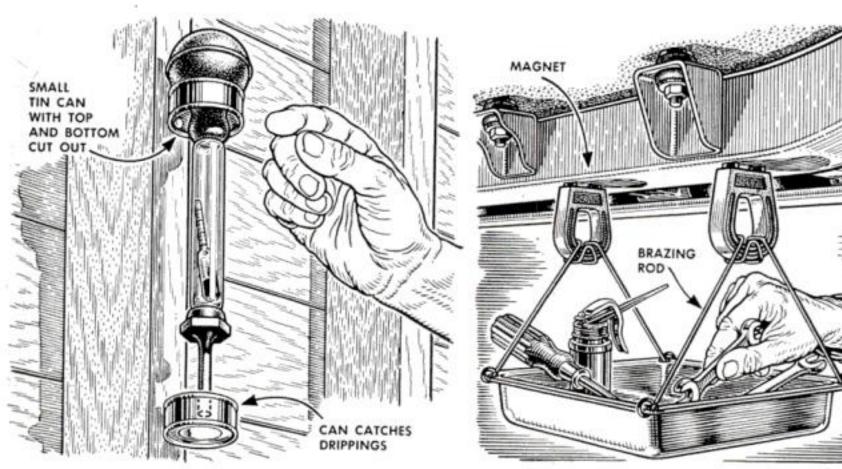
"Mr. Wilson," Smith interrupted, and for the first time since Gus had known the testy old codger, there was a twinkle of humor in his eyes. "What a pity you're not a lawyer. I could have used you in one of my corporations. What a beating I'd give Hastings and Company in that lawsuit—er, of course, I'll repair Mr. Coskey's car. Now, since I'm a very busy man, shall we get along?"

Next Month: Gus goes to the county fair

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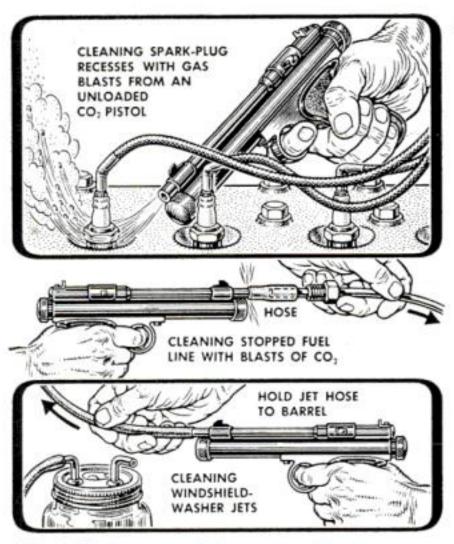
Feed drops of paint neatly to a touch-up brush by taping an eyedropper to its ferrule. Place the tip of the dropper a little below the ferrule so that paint will flow onto the top of the bristles and work its way evenly to the tip. Cover worn interior panels—especially those under the dash—with pieces of embossed sheet aluminum. Simply pry off the old panel and cut the aluminum to fit it, allowing enough extra on all sides to bend over the old panel.

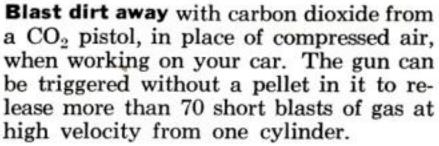


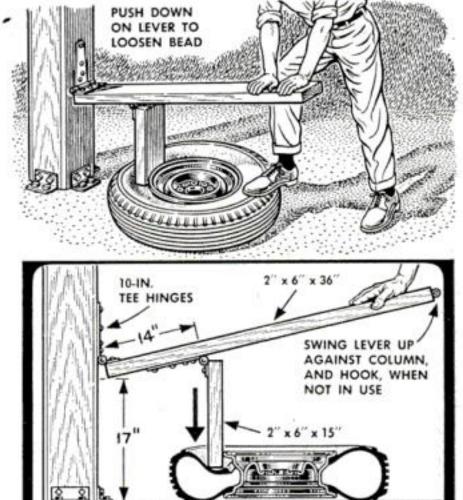
Store a hydrometer safely in a dripcatching hanger made from two small tin cans nailed to a stud. The upper can has its bottom cut out, forming a holding ring. The lower can is used with its bottom intact to catch drippings.

Keep tools and small parts handy in a tray supported by two husky magnets. They'll stick almost anywhere under the car and can be quickly removed and shifted elsewhere. Fasten the magnets to the tray at each end with brazing rod.

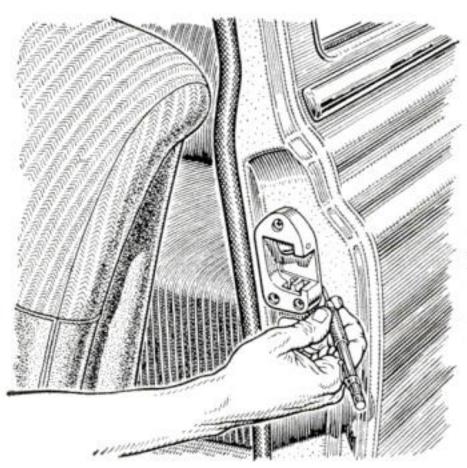
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Separate tire beads from wheel rims by applying the principles of physics instead of brawn. The hinged lever and pressure block shown in the sketches above will safely and easily break any bead free—even from the grooved safety-type rims.



Outline the position of striker plates when doors are working easily. Later, if screws loosen and a plate shifts, it can be returned to its original position. If the door shifts out of alignment, the marks will prove the plate's not at fault.



Seal your garage floor against pitting and flaking caused by salty slush brought in by your car. Combine equal parts of boiled linseed oil and turpentine and warm the mix in a pail of hot water. Brush on two coats eight hours apart.

Home and Shop

# How to Learn Good Table-Saw Manners

Those little errors can add up to big misfits. Here's how to do it right—the first time

# By R. J. De Cristoforo

THE magic in a table saw is there for anyone to use. But as the old saying goes, "It ain't what you do, it's the way how you do it." And the way that the expert does it—using all the advantages built into the machine—makes the difference between the slick work he produces and the creaky creations the less skilled craftsman (not you!) turns out.

A beginner's first problem may be an inability to analyze the reasons for his poor results. His machine was in perfect alignment when he made that miter cut—but when he put the two edges together he was wide degrees off! Why? Nobody had told him about such little mysteries as creep and the tendency of work to pivot during a pass.

The skilled worker knows that a board

# Is Your Home Too Crowded?

Lack of living space is a problem that plagues thousands of homeowners these days. More space, in fact, is now America's No. 1 housing need.

Next month, in POPULAR SCIENCE, be sure to see a special section devoted to helping you find—

**New Living Space for Your Home** 

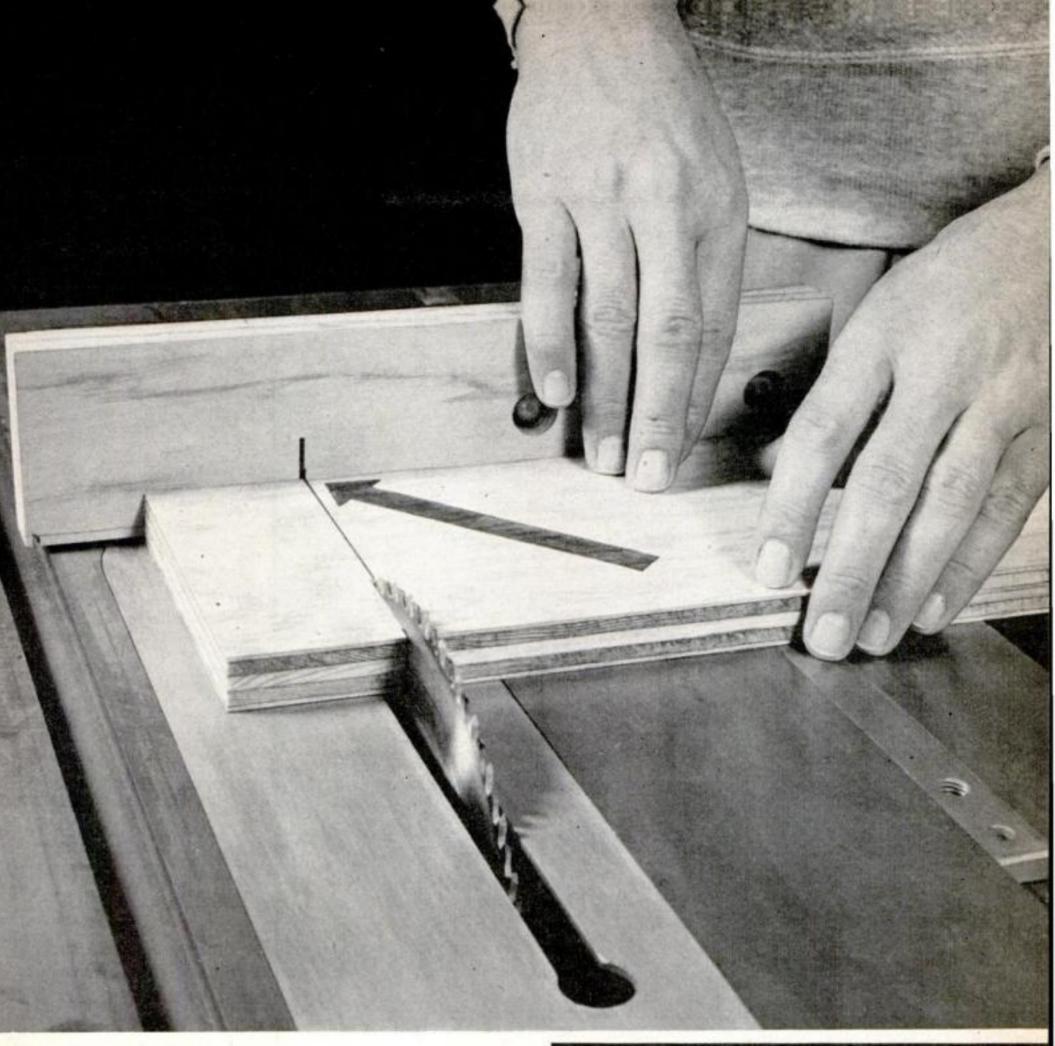
seldom has perfectly parallel sides. Thus he marks the stock edge that goes against his miter gauge and establishes a working edge. He puts his square against this edge and makes all width measurements from it. If he has a jointer, he will have planed the edge in advance to be sure it is straight and square.

His try square will rest against this edge when he draws his line before crosscutting. Why the square? It provides not only a cutting line, but a good check—before the work is ruined—on the squareness of the cut while his saw is making it.

A beginner, anxious to get to the cutting and making, sometimes regards these preliminaries as unnecessary caution. But scoffing at them is the surest way to frustration. The time involved in "measuring twice, cutting once" is negligible and pays off handsomely, not only in smooth workshop fun but in the final product.

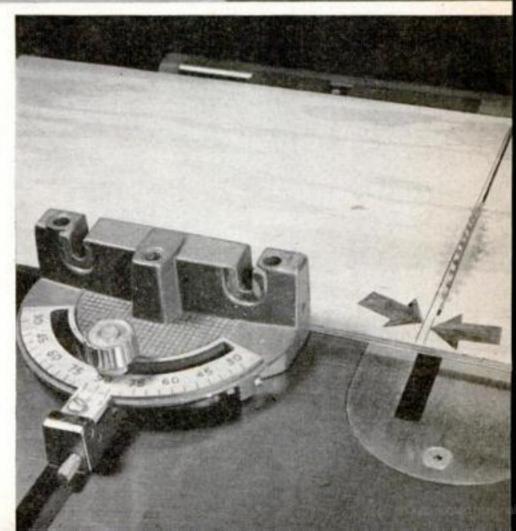
You can't see the little error that's cut into a piece of wood by the saw blade—not during the cut. But on assembly some parts are narrower than they should be and butted ends do not mate flush. That's when a beginner feels the urge to put the cover on his innocent power tool and take to golf.

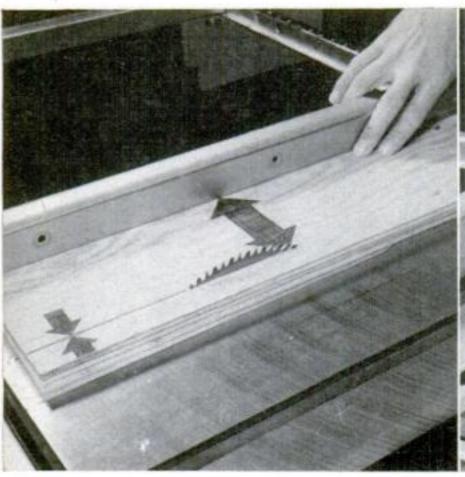
If you can eliminate the little errors that occur in about three basic table-saw operations—crosscutting, ripping and mitering—you'll establish an excellent foundation for almost all table-saw operations. The photos on the following four pages show the right way to use your table saw.

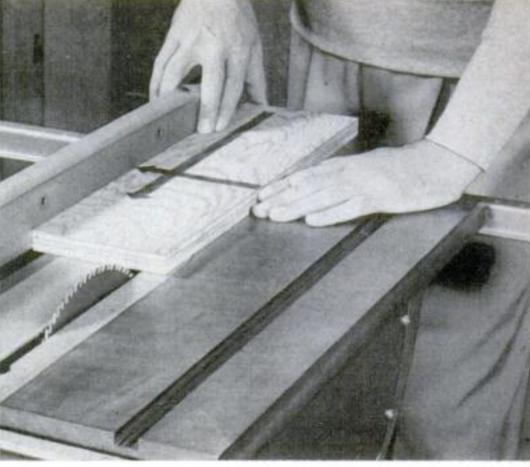


# How to make an accurate crosscut

vou when you're wrong. The error at right, on an 8" piece of plywood, was caused by less than one degree of miter-gauge misalignment. Without a line, the error might not have been caught until too late—on assembly. The pencil mark made before the cut is started also enables you to line up accurately the three important elements (above): the slot in the miter-gauge extension (arrow), the work, and the saw blade. If the miter-gauge extension is adjustable (slots instead of holes will permit this), it can be set to line up with any saw blade.





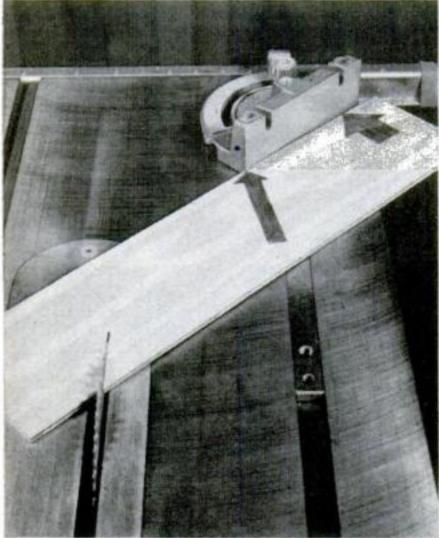


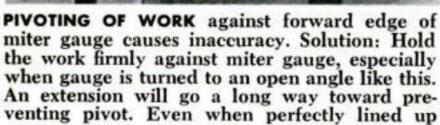
#### How to make an accurate rip cut . .

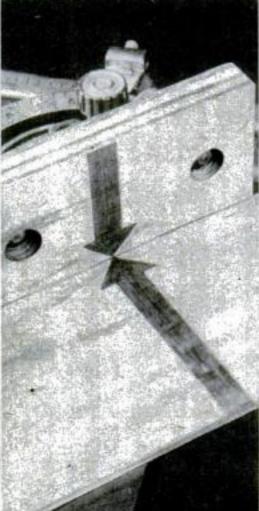
MEASURE FROM SIDE OF BLADE facing rip fence or work will be narrower by width of saw cut. If the blade has set teeth, be sure to measure from a tooth set towards the fence. Ending up with ripped work about 1/8" narrower than it should be is a common beginner's error.

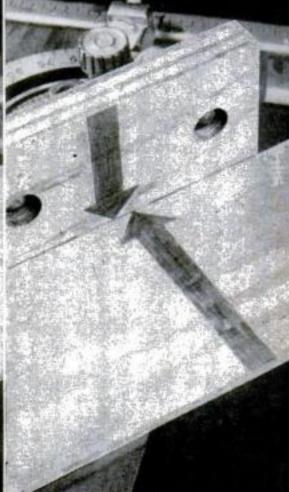
start cut by using left hand to hold work snug against fence before cut starts. Keep thumb of left hand hooked over front edge of table. Thumb of right hand hooks over rear edge of work to provide feed pressure. Other fingers straddle fence so the hand can't slip.

### How errors get into a miter cut ......

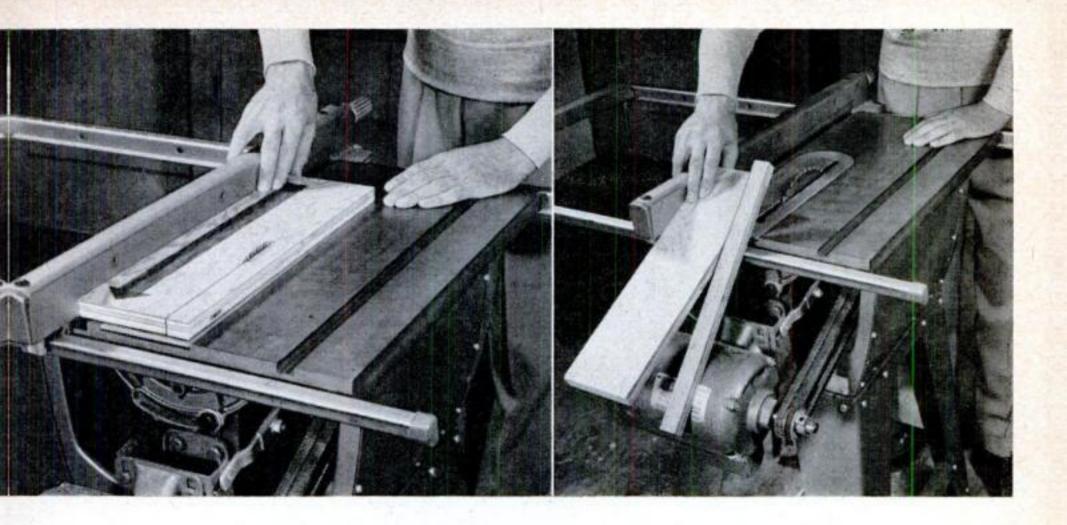








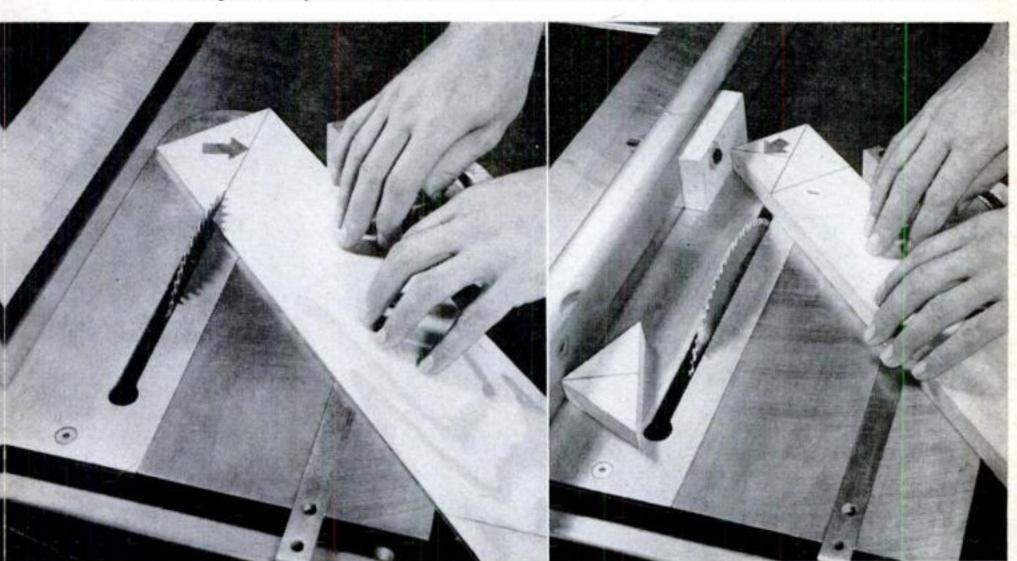
before cut, however (center photo), work can creep quite a bit along the miter gauge (right) before you reach the blade. Some operators face the extension with sandpaper to prevent creep. This helps considerably but still doesn't solve the problem of lining up the cut.



forward. Side pressure at this point, or beyond, would bind blade. Feed slowly, even less than blade will take. Forcing will cause blade to vibrate (chatter), which gouges sides of cut and causes work to move away from fence.

AT END OF PASS, left hand hasn't moved. Right hand completes cut and grips the work when the overhang at rear of table causes it to tilt up into palm. If the scrap doesn't fall off the table, let it stay put, until you've turned off the machine and the blade has stopped.

# Two simple ways to cut an accurate miter ......

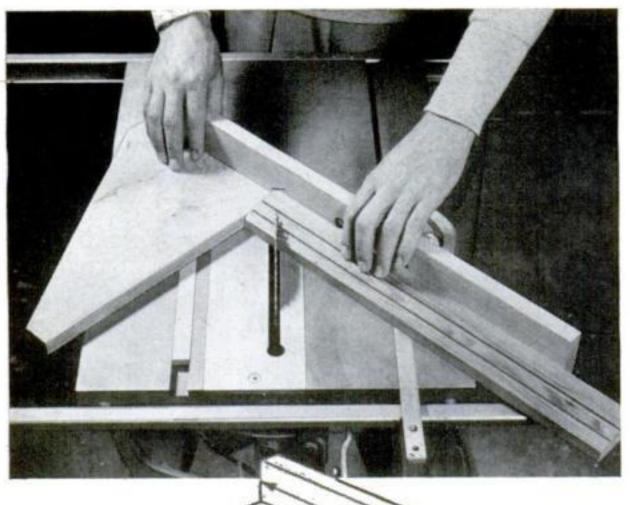


GUIDE LINE marked with a square—same method used for crosscutting—will tell you when you're wrong, but it's better to establish a mechanical means of eliminating error. One way is to cut the parts to exact length, then miter each end of each piece by setting up a

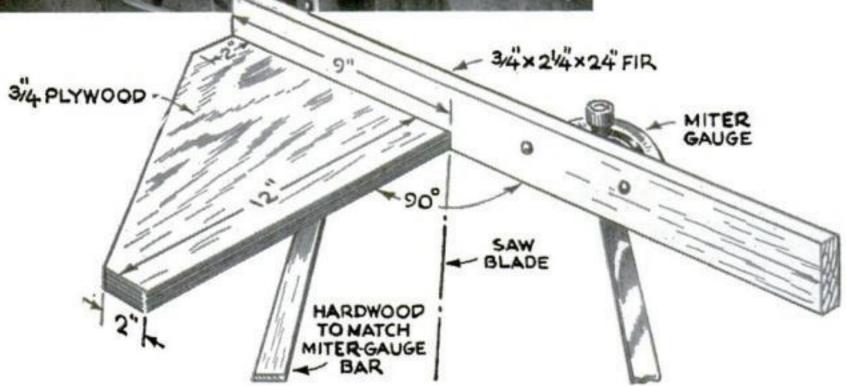
jig to control the cut, such as a stop block on fence. Correct distance is set from block to outside face of hollow-ground blade. Sides of penciled square are equal to width of work. Cutoff point is distance from corner of square to the center of the square's diagonal.

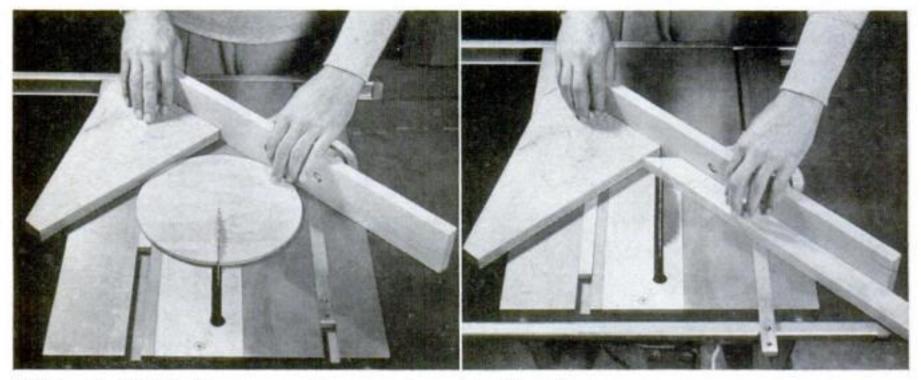
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# A jig like this makes miter cutting a cinch



slide of the saw blade so you can miter shaped moldings without a change in setup. The jig is easier to make than other types because it utilizes the accuracy of the miter gauge. Parts of the frame are cut to exact length before they are mitered. The dimensions of the jig shown in the sketch below suit a table measuring about 16" by 24".

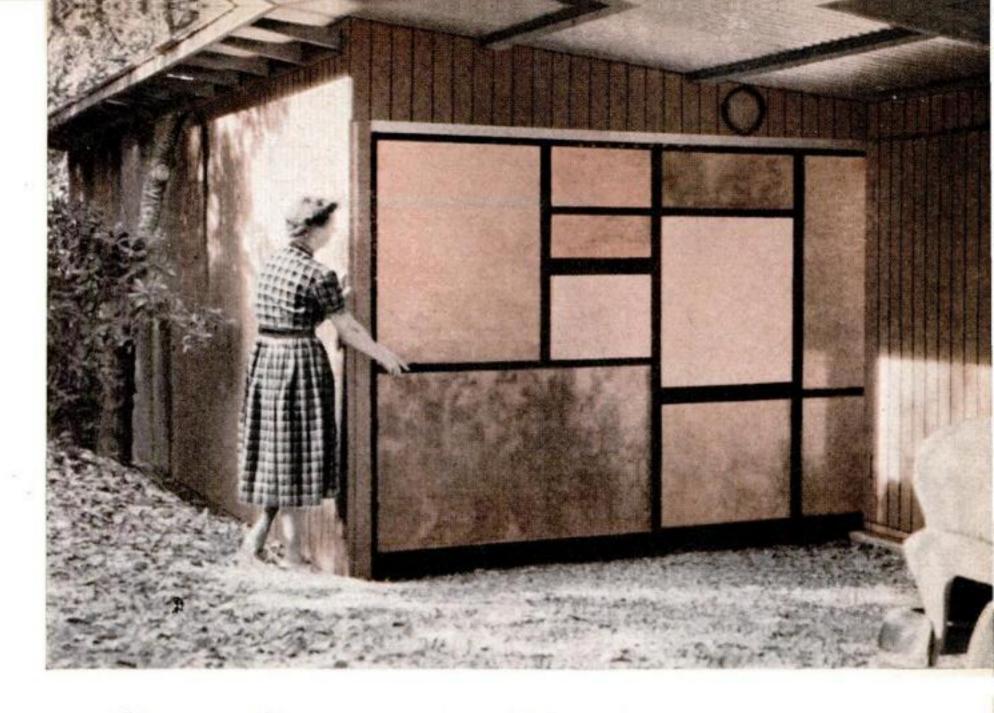




# Mitering jig gives you two extra dividends

**CUTTING DISKS** in half, or even in quarters, is a breeze with the mitering jig. Same setup, with blade about 1/16" above table, can be

used to mark diagonals on ends of lathe blanks. Pointed pickets are a cinch, too. Make one cut, turn the stock over, cut again.



# Our Garage Doors Are Colored Plastic

## By Jack Sterling

WE ADDED a splash of soft, glowing color to our home by building garage doors with a geometric pattern of translucent reinforced plastic.

The colorful panels didn't need painting, and they'll never need repainting—something any householder will find a blessing. The panels are assorted hues of the tough plastic, Alsynite, in the flat form. Inside, their translucence has turned a dark workshop-garage into a light—and strikingly attractive—place to work.

It's an idea you might adapt in many ways. For a new shop or garage (or at any other doorway, for that matter), build doors as we did, making the frames from two-by-twos or two-by-fours.

We had fun working out the geometric pattern before the door was built, making a family affair of it. You can use several colors if you wish. Or, if your home has lots of color already, you can stick to a single hue that will harmonize with the rest of the place.

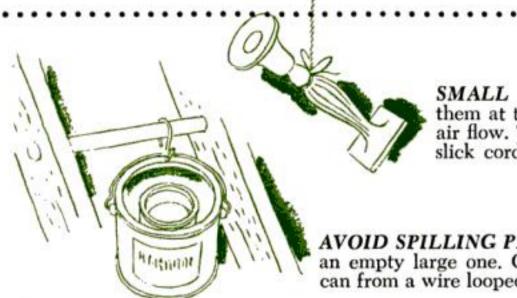
If you already have a garage door that is sound but dull, you can rebuild it to incorporate pieces of the plastic—as many or as few as you like. Even a limited area of the colorful, translucent panels will brighten things.

This reinforced plastic is thin but immensely strong. You can nail it to one side of any wooden frame, then cover the edges with batten strips. You'll save trouble if you paint all the wood parts in advance. The plastic is most easily cut with an abrasive cutoff wheel. A metal-cutting blade in a portable saw will do the trick, too.

If your door will be exposed to much rain you may prefer to set the plastic like glass. Rabbet the frame, run a bead of putty or glazing compound, set in the plastic sheet, then nail in strips of wood as stops. This will ensure watertight construction.

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## 10 Painting Tips



SMALL OBJECTS DRY FASTER if you rotate them at the end of a twisting string to increase the air flow. This evaporates the paint vehicle faster. A slick cord that doesn't shed fluff is best.

AVOID SPILLING PAINT from a small can by setting it inside an empty large one. On a ladder, hang the handle of the large can from a wire looped over one of the rungs.



A BRUSH TO BE RE-USED within 48 hours can be swished through solvent, dipped in linseed oil and wrapped in aluminum foil to exclude air.

PROS "BOX" PAINT to mix it thoroughly. They pour the top liquid (vehicle) into an empty container, stir the residue (pigment) to a smooth paste and slowly replace the vehicle. Finally, they pour the paint from one container to the other until the lumps are gone and the color is uniform.

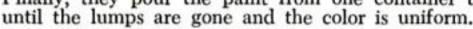
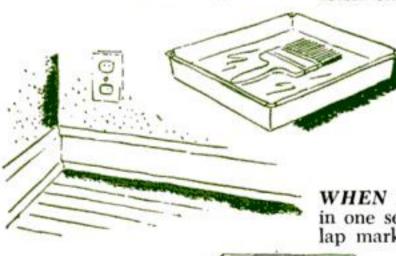




TABLE AND CHAIR LEGS are easier to paint near the bottom if you first raise the legs up off the floor by driving tacks into their ends.

AFTER PAINTING A WINDOW, ease it up and down occasionally while the paint dries to prevent sticking. Dry paint often chips when you pry up a sash that has become stuck.



CONDITION A NEW BRUSH by soaking the bristles thoroughly in linseed oil. The brush will then handle more flexibly and clean more easily.

WHEN PAINTING A ROOM, if you can't finish all the walls in one session, end a day's work at a corner or window so that lap marks and slight color differences won't show later.



PAINTING SMALL FURNITURE is less tiring if you place a board atop an old piano stool and set the piece of furniture on this makeshift turntable.

AWKWARD AREAS can often be painted more easily by fastening a roller or brush to an extension pole. A "helper" like this often eliminates risky ladder setups and saves time.

44 POPULAR SCIENCE

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# Choosing and Using Concrete Blocks

There's a size and shape that's just right for every building job

## Here are the basic facts about

Concrete blocks have blossomed out. They're no longer the ugly ducklings of the building trade. You can now buy blocks with handsome surface textures and in dozens of sizes and shapes. They're designed not only for eye appeal but for practically every wall-construction need.

Besides these new advantages, concrete blocks retain two old advantages for the home handyman: 1) They're easy to use; 2) they cost less than brick or stone.

## What they're made of

Concrete blocks may be either heavyweight (between 40 and 50 pounds for a standard 8"-by-8"-by-16" unit) or lightweight (25 to 35 pounds). The heavyweights are made of portland cement and water, mixed with such aggregates as sand, gravel or crushed rock. While they provide high load-bearing strength, they are less popular today than the lightweight blocks.

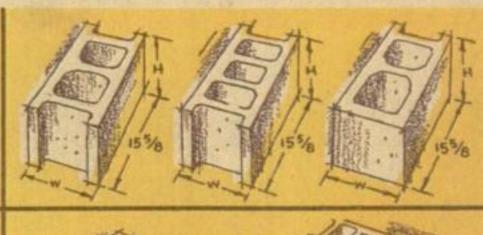
## These are the most

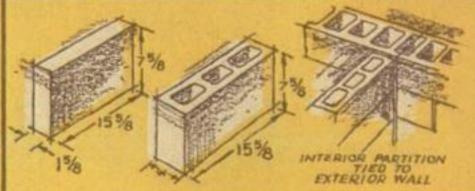
#### STANDARD WALL

Two- and three-core standard wall blocks come in 8", 10" and 12" nominal widths. Examples shown (two of each) are halfhollow-ended stretchers, corner types, and double-corner types.

#### PARTITION-WALL and BRICK

Solid, partition-wall blocks and cored blocks of 4" and 6" nominal width are used also for cavity walls and floor slabs. Brick (far right) may have frog (mortar recess) or flat face.





## CONCRETE BLOCKS

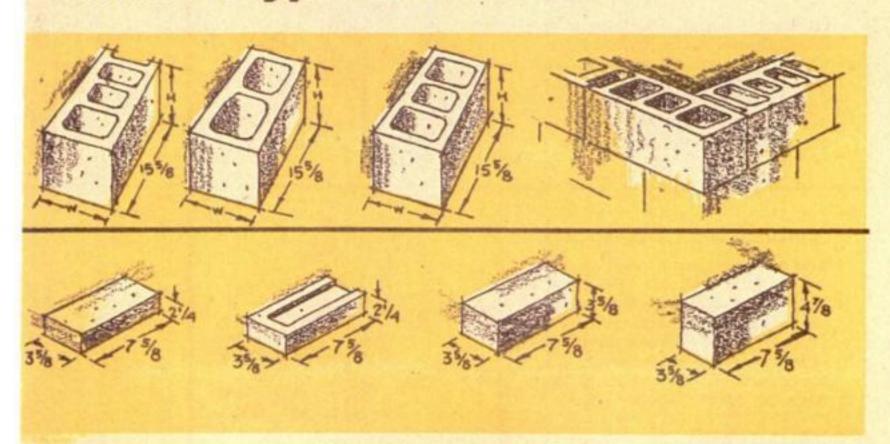
The lightweights are also made with cement and water, but the aggregate is cinders (causing many people to refer to all blocks as cinder blocks), expanded shale, clay, pumice, or some other lightweight material. Besides being easier to handle than the heavyweights, they give better insulation against both heat and sound. They are also more attractive in texture, and provide a better bond for stucco veneer, paint, and other surface treatments.

## Sizes and shapes

While some concrete blocks in the smaller sizes are molded solid like brick, the majority of the larger blocks are cored. The most common of these hollow blocks has a face that is nominally 8" high and 16" long (actually 7\%" by 15 \%" to allow for \%" mortar joints). Its nominal width can be 8", 10" or 12".

Stretchers make up the bulk of any conventional wall. For any special

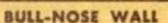
## common types of blocks



## These blocks solve special

#### FULL and HALF HEADERS, HALF CAP and CAP

Headers tie in floor joists, bond brick facing to block walls. Half caps seal exposed part of course below a wall step-in. Cap blocks top standing walls.



Bull-nose blocks take the place of standard corner blocks for rounded corners, columns, etc.

#### BOND BEAM

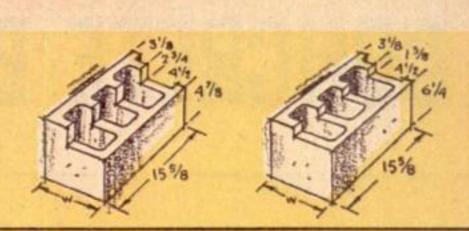
Designed to tie a wall together at the top, bond-beam blocks provide either knockouts or open channels for reinforcing rods and poured concrete.

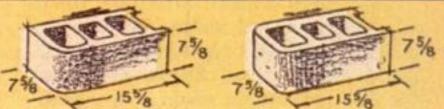
#### LINTEL

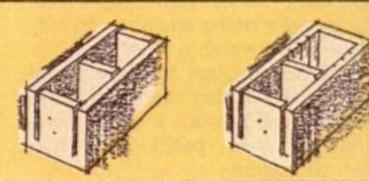
Used over doors and windows, lintel blocks have recesses for sash or frames. They come in single and double height for short- or long-span openings. Mating bond blocks continue channels over adjacent walls.

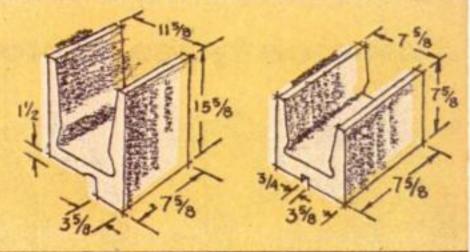
#### CONTROL JOINT and PILASTER

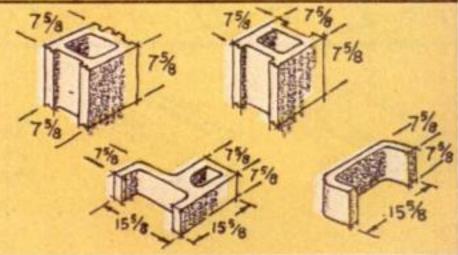
Tongue-and-groove mating of control-joint blocks lets large walls expand and contract (the joints are sealed with calking). Pilaster blocks increase stability of load-bearing walls. Some, like those here, have recesses in the ends for control joints.



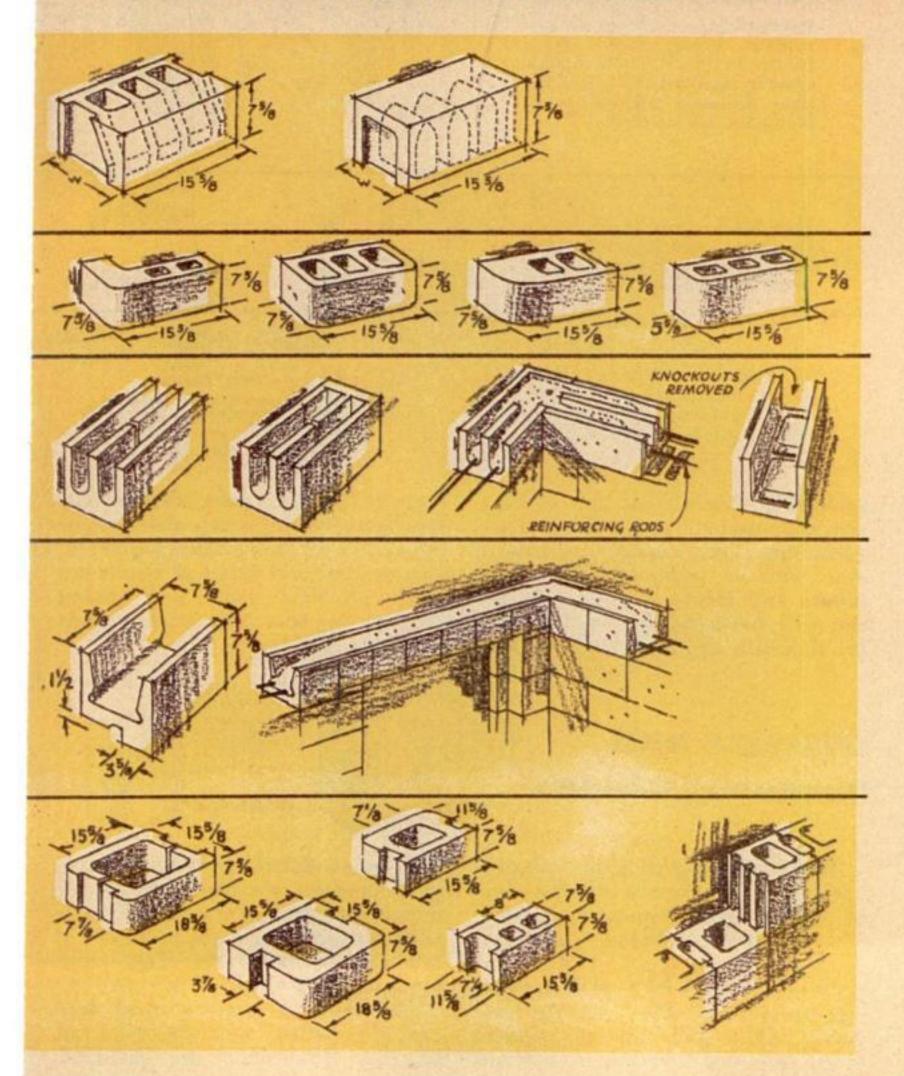






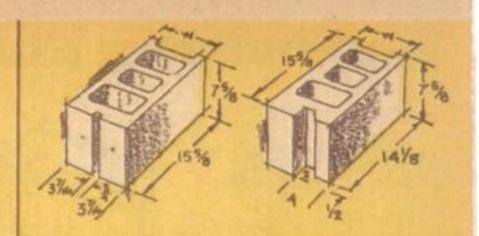


## wall-building problems



#### **CONVENTIONAL SASH and JAMB**

Recessed at one end to accommodate either metal sash, frames or jambs, these blocks come in standard and half-block sizes. Bull-nose sash and jamb blocks are also available.



#### SILL

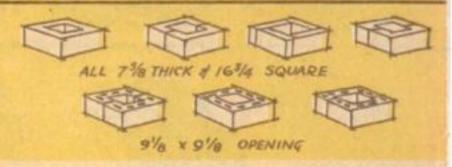
Used below windows, sill blocks have top faces designed for (left to right) standard wood frames, metal frames, broad stools.





#### CHIMNEY

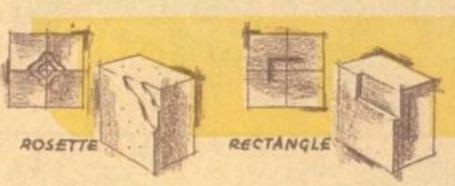
Combinations of chimney blocks will accommodate three standard sizes of chimney tile, a cylindrical flue, or multiple flues.



problems, however, as for corners, you may need one or more variations. Most large lumberyards can supply you with a wide selection—half-blocks and blocks with one or two flat ends, blocks with one or two corners rounded, and blocks with special

recesses for door jambs, window casings, glass-brick inserts, and steel or
poured-concrete reinforcing cores.
Among the solid types of blocks are
small bricklike units and coping
sections, together with several kinds
of ornamental blocks.

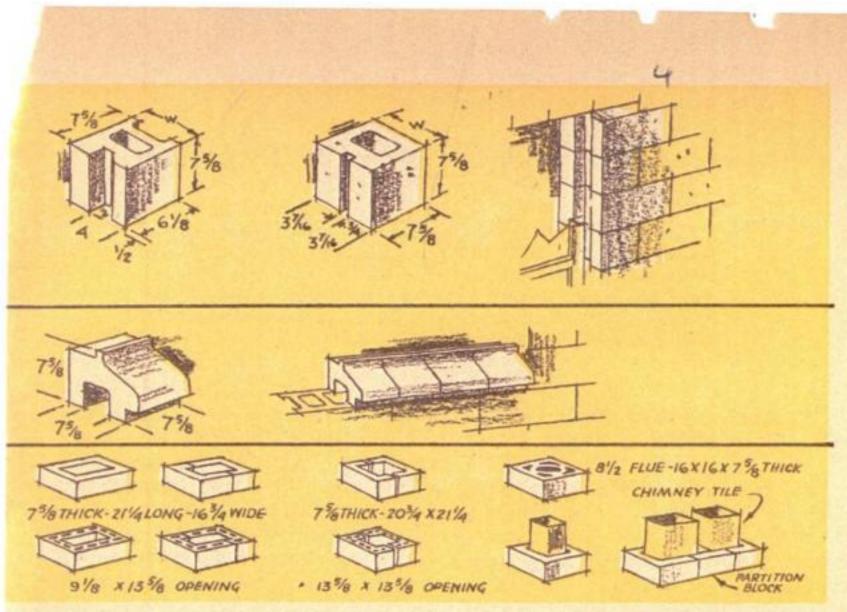
## Off-size and textured blocks



When planning a home improvement, you may want to consider some of the many ornamental concrete blocks that are available. A unit that is similar to the standard block, but only half as high (4"), gives a pleasing, modern wall effect when the horizontal joints are accented. Square stretchers with one corner recessed

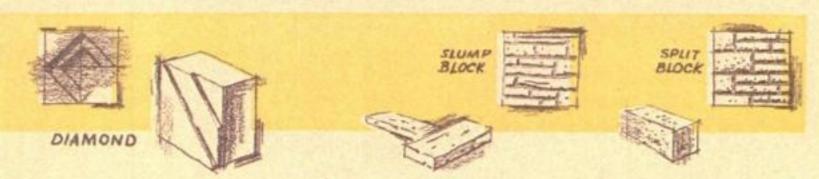
are also available. Grouped in fours, they produce rosette, rectangle or diamond patterns. For a unit with unusual texture, you might go for one of two newcomers in the field—split block or slump block.

The split block has a rough face and is unusually long and thin, but its base dimensions are standard.



A look at the blocks on these pages will familiarize you with their names, sizes and uses. But before you start on any concrete-block project, check with the suppliers in your neighborhood to find out what sizes are available or can be ordered for you. Then

plan your work to conform with the block dimensions. It's a waste of time to make a fireplace some odd length, or to set a door in some arbitrary spot, and then have to chip or cut off blocks to fit. With a bit of foresight, you eliminate such problems.



Slump block is a peculiar offering with a remarkably unblocklike appearance. It is made from a concrete mix that causes the units to sag or slump when they are taken from the molds. Both height and texture vary enough to give a rugged, informal look.

For still more variety, blocks are

offered in soft pastel shades (usually greens and browns). Unlike blocks that are painted on the outside after they are set up, these need no further maintenance: The color is cast right into them. Special blocks with hardglazed, waterproof faces similar to tile are also on the market. Some are glazed on both faces.

## RULES for building with blocks

Concrete blocks are inexpensive and easy to handle. Professional masons will tell you that they stack up three times faster than brick, and with less than half the mortar. Here are a few simple block-building rules. Follow them and you'll be sure of a strong, workmanlike wall, even if you've never tried using blocks before.

## Always rest a block on a solid footing

It's important to provide a solid base for a block wall, not only for strength but to seal out moisture from below. Make the footing of poured concrete. For a fireplace, indoors or out, this takes the form of a large concrete pad. The footing for a regular wall should be placed below frost line. Make it as deep, and twice as wide, as the wall is thick. Center the wall on this footing for equal load distribution.

## Use dry blocks

If you must store blocks outdoors before using them, protect them from the rain with a tarp or some building paper. Wet blocks expand. If you set them up in this condition they will shrink when drying, giving you weak, possibly leaky joints.

## Choose the right mortar mix

For most purposes a good mortar mix is one part masonry cement and three parts' sand. For an extra-

strength mortar, as for a high retaining wall, use only two or three parts' sand to one part portland cement. In either case, mix with just enough water to give a plastic mix that clings nicely to the trowel and block, without being so soft that it squeezes down too much when you lay the block. Test the consistency of the mix between a pair of blocks.

## Cover the footing with a full bed of mortar

This insures a good bond for the first course of blocks. Before you place each block after the first one. butter one end of it with mortar and squeeze it against the preceding block to give a 3/8" joint. Use your trowel to cut off any mortar that oozes out, unless you want it to harden that way for an informal appearance.

## End one course before starting another

It's a way to avoid inaccuracies. For the second and successive courses. spread mortar on top of the laid block in the area that the new one will cover-usually only along the front



and back edges. To build a stronger wall, if needed, use full-bed joints. You get these by spreading mortar over the entire top surface of the cement block.

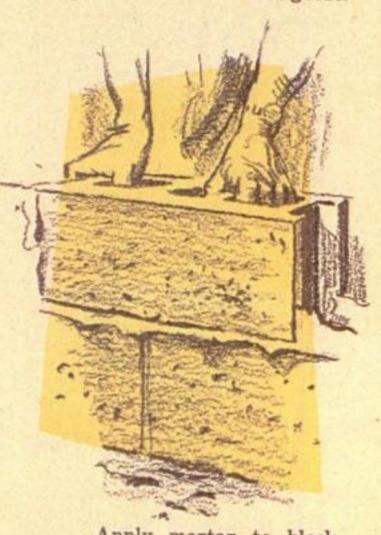
### Make frequent checks with a level

Unless you are doing a job where joint irregularities are part of the decorative scheme, check each block lengthwise and from front to back with a level, as you go. Stretch a string from one end of the wall to the other to insure block alignment and use the level, vertically, for frequent plumb checks.

## Don't use mortar that's gotten too old

Your mortar will stay usable for about two hours in hot weather, and

Lay corner blocks first. Stretch string between them as face guide.



Apply mortar to block end before placing it.

Point formal-wall joints as soon as the mortar starts to stiffen.



To clean face, wipe with gunny sack, or scrape with wood.



True blocks with long level, or short one on straight 2"-by-4".

## RULES (continued)

a bit longer under cool conditions. Within those time limits you can retemper it by working it over with a shovel or trowel, adding a little water when needed. But when the mortar begins to lose its cohesiveness, don't try to make it "stretch." Throw it away and mix another batch.

## 8 Point joints, clean block faces as you go

As the mortar joints stiffen up, go back and wipe any spilled mortar from the faces of the blocks with a gunny sack. Then point up the joints the way you want them to look.

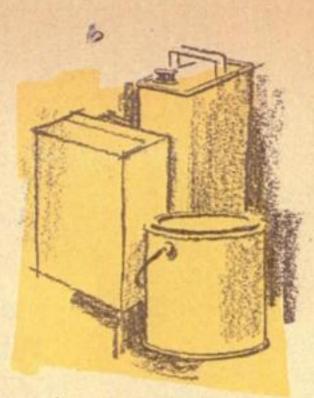
## 9 Now seal the top of the wall

It's important to seal off, or cap, the top of a hollow-block exterior wall, to keep out rain. Some manufacturers make solid block for this. If your dealer doesn't stock them, you can do the job by sandwiching strips of expanded metal lath in the last horizontal joint. After you lay the final course of blocks, plump mortar into the voids until you have filled them flush with the top of the wall.

A good way to bind a wall tightly together, and at the same time cap it, is to make the top course a bond beam. Use channel blocks with metal lath under them. Lay these blocks channel-side up, and fill the trough they form with concrete. By embedding two lengths of reinforcing rod in the concrete you can strengthen the cap still more.



ly insulative wall.



For color-you can use powdered or fluid cement paint, or stain.

## ... and for the FINISH

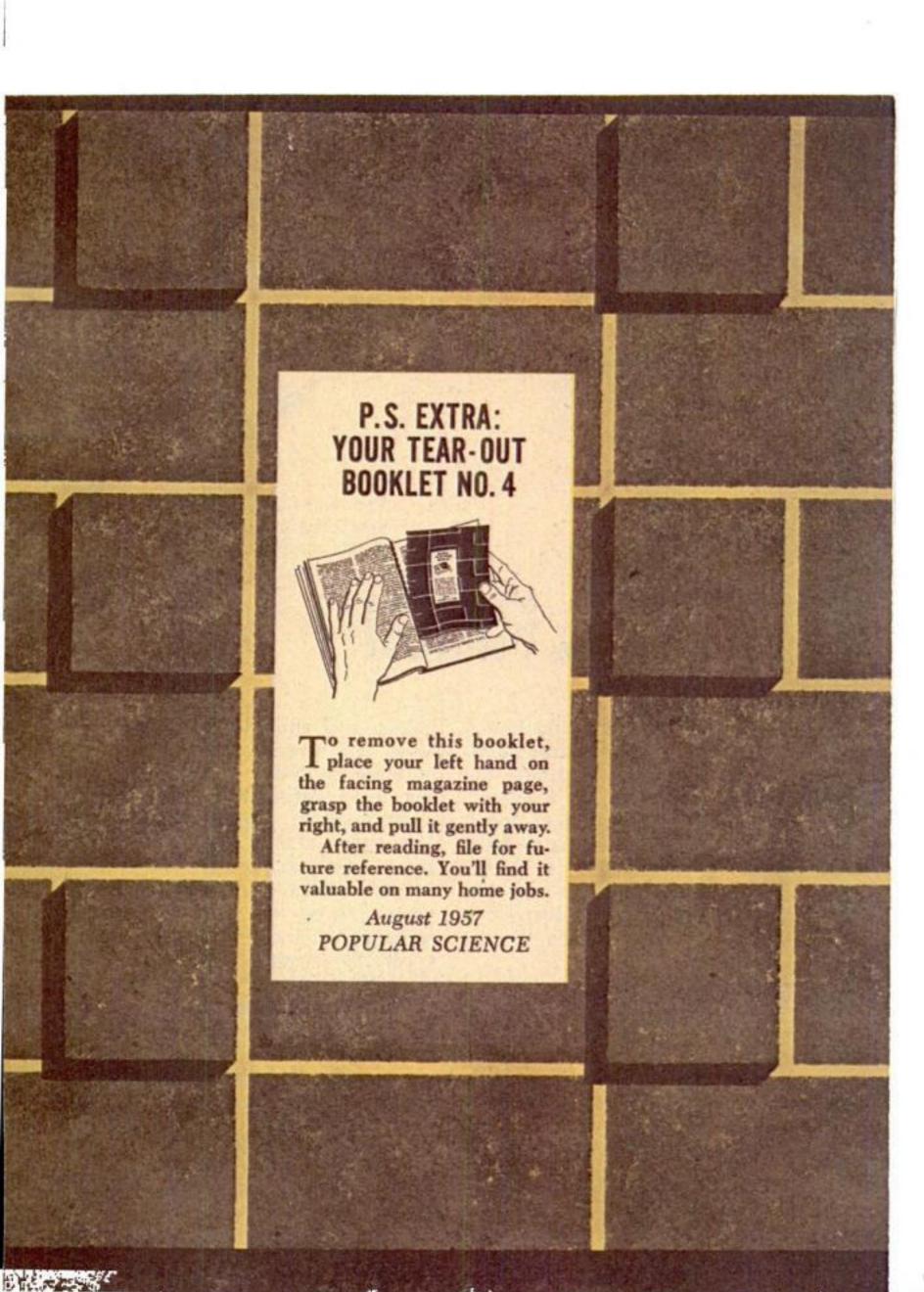
Insulation. When building house walls, you may want to insulate them. Dead air in the hollow blocks has considerable insulative value in itself. But for minimum heat loss, pour loose rock wool or vermiculite into the wall voids after laying each two or three courses. A wall treated this way is 20 percent more insulative than one of standard wood-and-plaster construction.

Waterproofing and paint. Low maintenance has always been a popular feature of concrete blocks. A painted block wall destroys part of this inherent feature, because it needs doing over from time to time. So if you are willing to settle for a natural shade, use silicone waterproofing liquid, instead. This is a permanent

finish, and adds to the life of the block. For small color modifications in either natural or tinted blocks, you can add a little color to the silicone waterproofing, converting it into a waterproof stain. Apply the liquid with a whitewash brush.

For stronger color, but still in the pastel range, use one of the old reliable portland-cement paints made especially for masonry. They come as a powder—basically cement plus pigment. You mix this with water and apply to a wall that has first been dampened with a fog spray from a hose nozzle. A variation of this is a simple wash of cement and water.

For really brilliant color, turn to the newer types of masonry paint. These may be oil-, rubber- or resinemulsion-based. All of them are durable and easy to apply.





WASHING A RECORD will do the best job of getting rid of surface noise caused by dirt.

Use a mild detergent in cool water and wipe along the grooves with a soft cellulose sponge.

# How to Take Care of Hi-Fi Records

Dirt and scratches make noise—not music. Here's how you can make those prize discs sound better and last longer

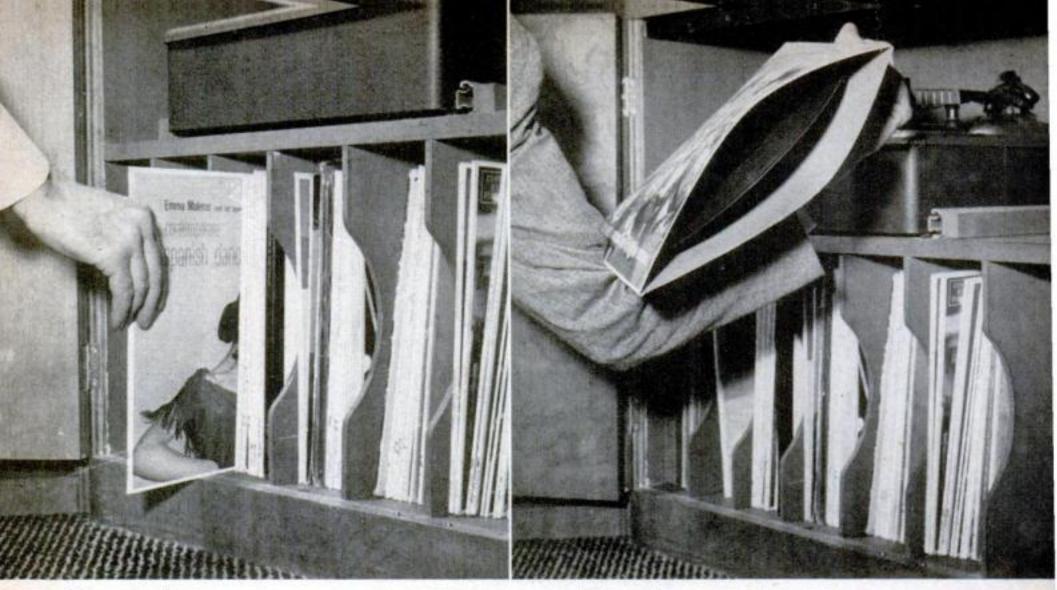
## By Carl Dreher

Five-dollar bill for a new LP record. Then comes a nagging doubt that grows to a fine fury at everyone connected with the record business—except the real culprit. Yourself. After half a dozen plays, that beautiful record begins to hiss,

click, crackle and pop like a barrel of breakfast cereal. You've got a good case of "surface noise."

Like many another record fan you may have interpreted the widely plugged "unbreakable" quality of LPs to imply ruggedness in all respects. Actually, LPs are more delicate than the old 78 shellacs —the vinyl base is softer and more easily

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How to take a record out of its cover without scratching it

STORAGE SPACE NEAR THE PLAYER makes it easier to take care of records—there's less chance that you'll strew them around the room. A door will keep dust out of your record bins.

the jacket open between your fingers and your body, or the crook of your arm. This keeps the cardboard from scratching the grooves.

scratched. The same bits of household grit and dust look bigger to the tiny LP microgrooves and smaller needle.

Another headache: vinyl is an excellent electrostatic generator, and the static charge on the disc attracts and holds dust. This dust is a million microscopic chisels chipping away at your records as the needle moves along the grooves, or you slide one record on another, or even just slide the record out of its sleeve.

What can you do about it? The manufacturer doesn't put surface noise on a record, and you don't have to put up with it. There's a right way to handle a record, clean it, store it and play it to keep it in good shape. It doesn't take much more time or effort to do it the right way.

Good record care isn't prissy. It's a practical matter of saving money, extending the life of your records and increasing your listening pleasure.

It can't be put off, either—like washing a window. Every time you play a dirty record you scrape off some of the hi in the fi. Nothing you do later can put it back.

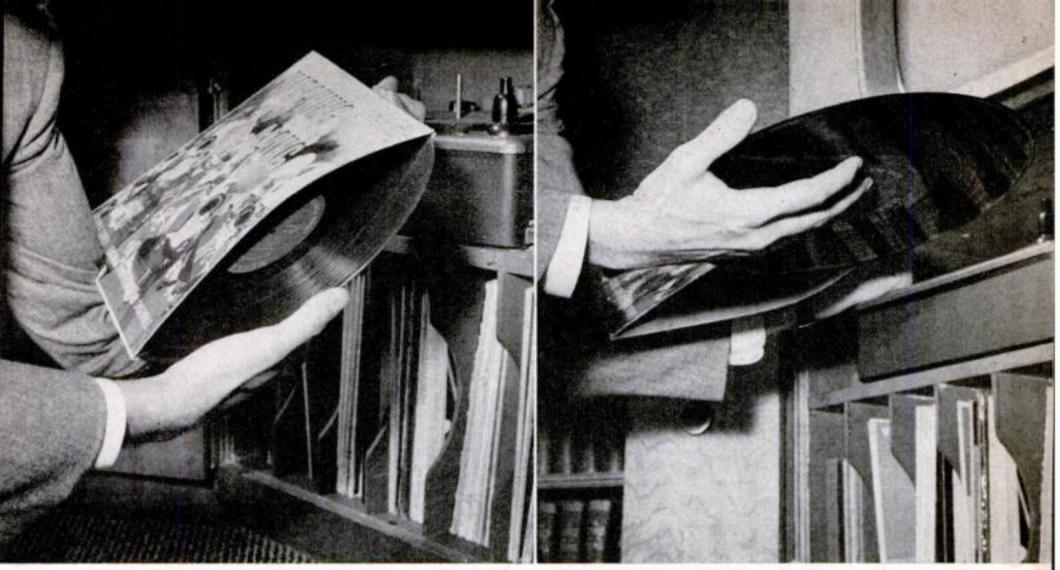
Handle with care. Much damage is done by careless handling. When you pick up a record, grasp it by the rim with both hands, instead of across the grooves—just as you keep smudgy finger-prints off a fine photograph.

When you remove a record from its cardboard jacket, or insert it, spread the sides slightly apart so they don't rub the record. Still better is to provide a flexible plastic cover for each record. The polyethylene and glassine in these are softer than the vinyl in the record and won't scratch it.

Always keep both records and player covered when not in use. Clean the turntable frequently with the small brush attachment of your vacuum cleaner. Any dirt on the turntable will be transferred to the record. And you'll keep your turntable from becoming a sanding disk—in the brief moment when it is turning and the record is still, grit from the turntable will grind on the record. Clean the stylus itself only with a very soft camel'shair brush.

Use a moist cloth. Wiping a record with a dry cloth just increases the build-up of static that attracts dust. Moisten a piece of cheesecloth—it's free of lint—and wring it out damp-dry. Then wipe gently in the direction of the grooves, never across them.

You can sometimes make a record



with the Jacket spread apart, reach inside the opening until your fingers touch the label and your thumb is along the rim of the record. Then tip the opening down and the record will slide easily into the palm of your hand without your touching the grooves. Easy, and it pays.

KEEP FINGERS OFF the playing surface or the oily prints will cause dust to stick in the grooves. When you have to hold a record in one hand, balance it this way with the fingers on the label and the thumb on the rim so that no part of the hand touches the grooves.

sound better than it did when it came from the store. Accumulated dust from the dealer's shelves may cause surface noise unless you damp-wipe a new record the first thing before you play it.

For about 70 cents, you can get a chemically treated cloth that makes wetting unnecessary. Also make sure that your stylus is clean and in good shape before you play new records.

Atomic brushes. For more frequent cleaning, you can get a small brush that has a strip of mildly radioactive material behind the bristles. This material ionizes the air above the record, causing it to become conductive and drain the static charge off the record. Thus loosened dirt swept from the grooves won't be attracted back to the surface.

A 1" radioactive brush costs about \$4; larger ones cost up to \$15. You can apply the brush to the record as it spins on the turntable. A few revolutions should do the job.

Ordinary brushes designed to ride the record continuously sweep dirt effectively, but have two disadvantages: They increase the static charge on the record, and dust collected under them is likely to scratch it.

If you want to get real fancy, you can



USE TWO HANDS to put the record on the turntable. Hold it by the edges and place it down flat with the turntable stopped. Never put on or take off a record while the turntable is spinning. Grasp the record in the same way when you flip it to the second side.

## Simple rules of record care keep music in and noise out

#### DO

- Handle records by the edges and label.
- Keep records in polyethylene or similar flexible-plastic covers.
- Wipe dusty records with a chemically treated or damp cloth.
- Wash dirty records in cool water using detergent and soft cellulose sponge.
- Store records vertically.
- Clean the stylus with a camel's-hair brush, not with your finger.
- Use a diamond stylus and have it examined microscopically after 250 hours of playing.
- Use a gauge to measure stylus force and keep it at the recommended setting.
- Keep the turntable covered when it's not in use, and clean it periodically.
- Level the turntable.

#### DON'T

- Don't put a record on while the turntable is spinning.
- · Don't touch the playing surface.
- Don't let playing surfaces rub against one another or against other objects.
- Don't slide records in or out of cardboard jackets without flexing the cardboard to reduce friction.
- Don't expose stored records to heat or moisture.
- Don't wipe a record with a dry cloth.
- · Don't wipe across the grooves.
- Don't intermix warped and straight records when stacking records on a changer.
- Don't leave unprotected records lying around on tables.
- Don't lend out prized records—your best friend's equipment may not be your records' best friend.

buy a separate ionizing unit that's held on an arm just above the record to drain off static. Cost: about \$20. A smaller version, for about \$4.50, clamps to the tone arm near the stylus. It weighs only about half a gram, so it won't increase the stylus pressure much.

Anti-static chemicals. For a dollar or so, you can also get anti-static chemicals that are wiped or sprayed on a record. These are said to work by providing a conductive coating that "grounds" the static charge.

Chemicals must be used very sparingly, however. Don't put on too much on the theory that if a little is good, a lot is better. Too heavy a coating can gum up the fine grooves and stylus and interfere with tracking. Be skeptical also of excessive claims. Some makers of chemical preparations, impregnated cloths and other gimmicks include such nonsense as "lubricates the record, gives noise-free reproduction, adds tonal brilliance to the music."

Records do not need lubrication, and tonal brilliance can't be enhanced by gunking up the surface with anything. Nor does it follow that all noise will be eliminated even if all static is. Some imperfections occur in manufacture, others in handling at the store or unavoidably in the home. There's no point in worrying over these. The idea is to enjoy music, not fret about it.

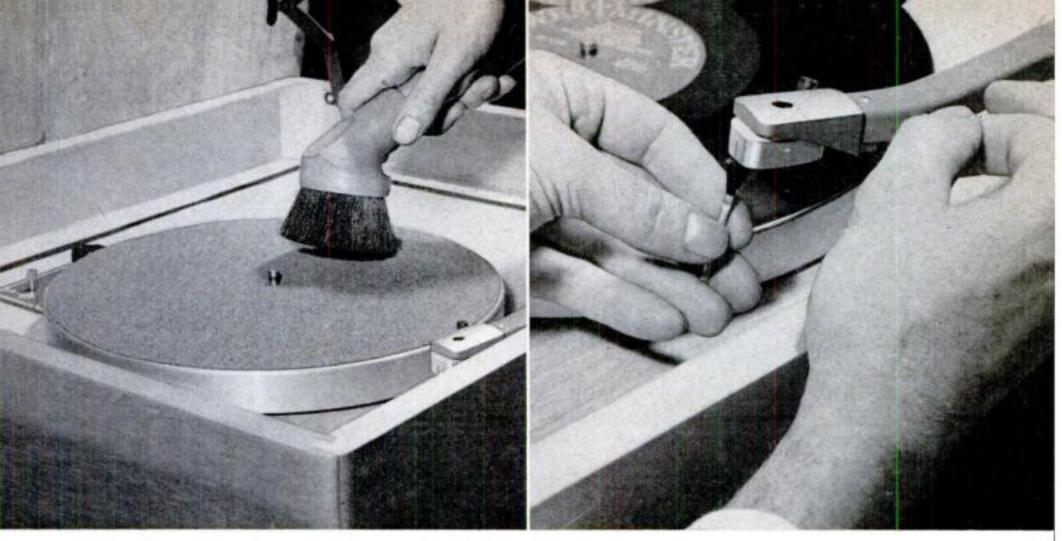
Dunk dirty discs. One good treatment for a dirty record is a trip to the kitchen sink. Ground-in grime can't be brushed or wiped out.

Place a rubber mat in the bottom of the sink, run in a few inches of cool water, and add a teaspoon of detergent (not soap) to each quart of water. Immerse the records one at a time and make a few light passes with a cellulose sponge in the direction of the grooves. Also press the sponge against the grooves, then lift it up—the suction helps to loosen embedded dirt. The ink on some labels may run when wet, so keep water off the label as much as possible.

Rinse each record under cool running water, stack it vertically in the dish rack and let it drain dry. Don't wipe the surfaces with a cloth or you'll just put back more dust and lint.

Never try to clean records with alcohol, naphtha, cleaning fluids or other chemicals. They may dissolve the surface of the plastic.

Store them vertically. To prevent abrasion and warping, records should be



## Keeping the turntable and stylus clean

VACUUM THE TURNTABLE and compartment frequently with the cleaner's small brush attachment, taking care not to bump the pickup. If the turntable has a rubber or cork mat, wipe it with a damp sponge before each playing session.

clean the stylus with a soft brush after each playing. Dust and dirt from the record collect on the tip and may cause poor tracking and distortion. Never touch the stylus with your finger—it will add dust-collecting oil.

stored on edge between partitions about 4" apart. Always keep enough records in each compartment so that they can't lean, but don't pack them in so tightly that they squeeze each other.

Locate the storage shelf or cabinet away from heat sources, including radiators, amplifiers, incandescent light bulbs and strong sunlight. Records can be ruined if placed on a window sill or left in a car on a hot, sunny day. Long-term dampness is also harmful.

Records are not affected by low temperatures, but they do become brittle and must be allowed to warm slowly to normal room temperature before they're handled or played.

Watch out for changers. The upper crust of the hi-fi fraternity won't stack their records on an automatic record changer. They play them one at a time on a turntable.

Whether you have a changer or not, it's best to play records singly. If you do stack them, take care to place them very gently on top of one another, straight downward. Lift them off the same way. Never leave records suspended on a changer—that's a sure way to warp them. And never intermix warped discs with flat ones. The uneven records wear

against the straight ones and keep them from riding flat on the turntable.

For stacking, records must also be extra clean. Any dirt particles on the face of one will be spun against the face of the next record.

Check the stylus. As the stylus wears, it develops "flats" on the sides of the spherical tip. These act like tiny chisels and plough up the grooves in a record.

It's best to use a diamond stylus—it lasts longer and will be cheaper in the long run. But even a diamond wears out. Playing both sides of a 12" LP disc, it travels about a mile.

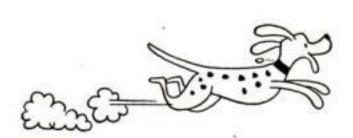
It's a little troublesome, but it's worth having your stylus examined microscopically about every 250 hours of playing. If it shows wear, discard it. The cost of replacement may be only a fraction the value of a good record collection. If a stylus is still okay after 1,000 hours, it's living on borrowed time.

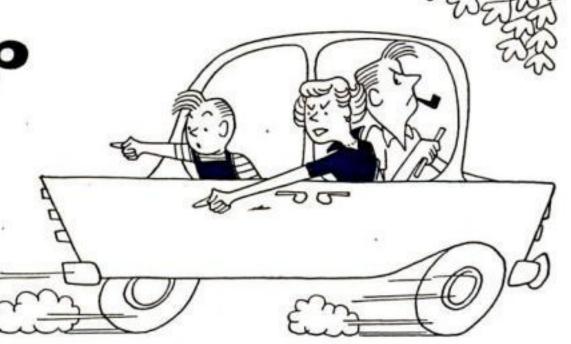
Even a new stylus will not track correctly if the turntable isn't horizontal. Level it carefully in both directions front to back and side to side.

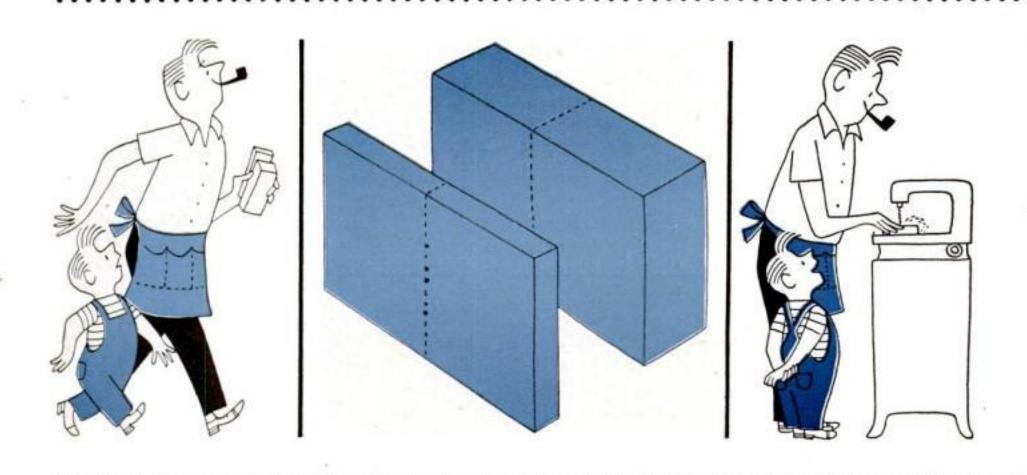
A gauge to measure stylus pressure is inexpensive. Use one to keep the tone arm accurately balanced to the setting recommended by the manufacturer. END

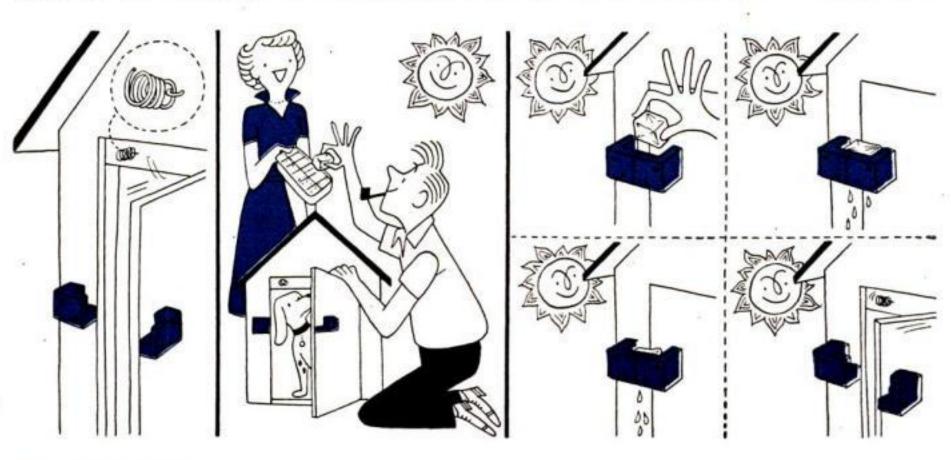


By Roy Doty and Harland Manchester

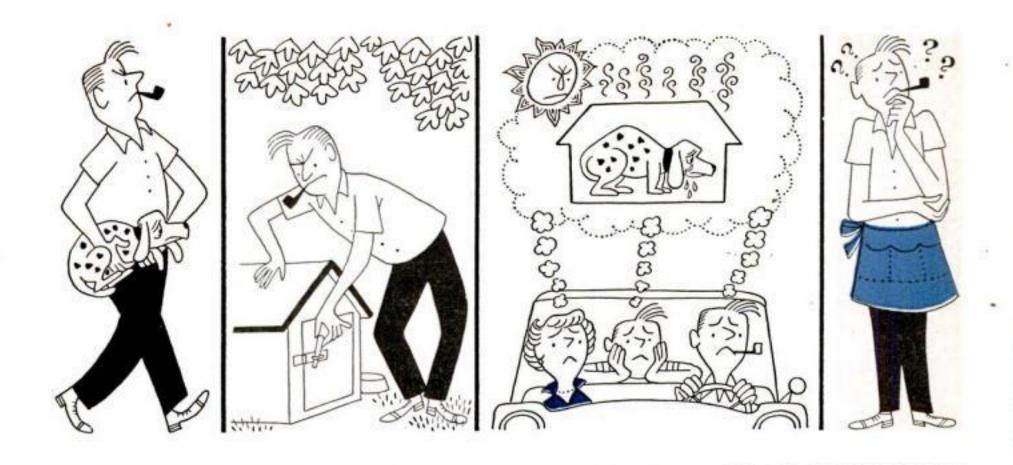


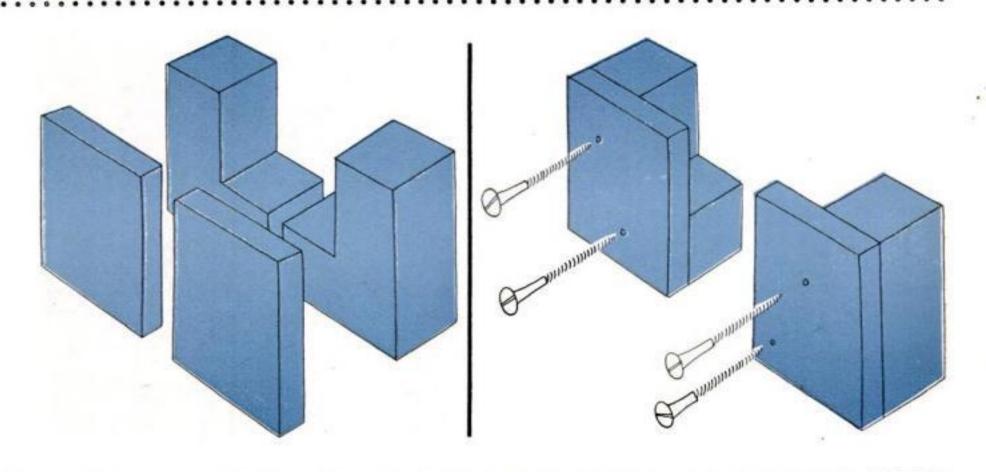


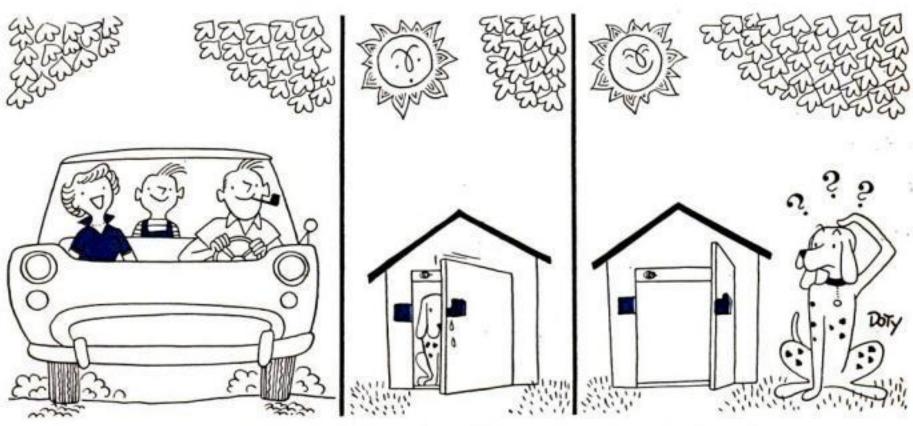




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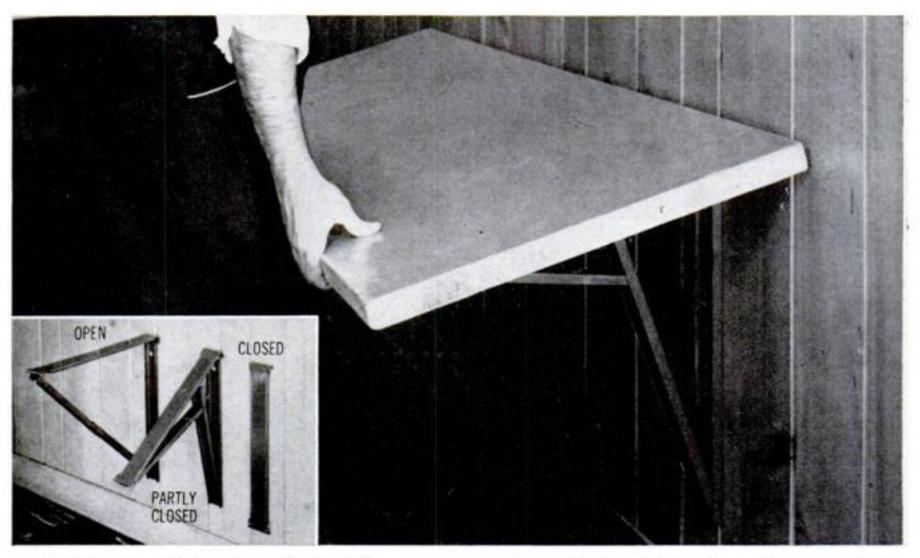




Next month: A kitchen rack that rolls out canned food

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## New for the Handyman

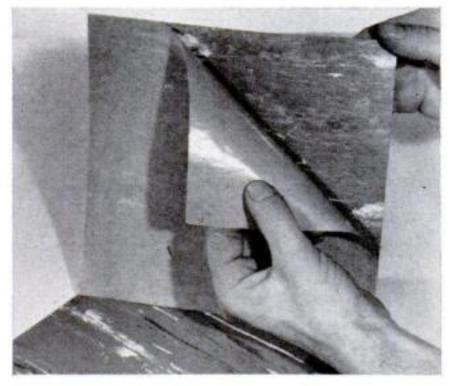


1. Table Brackets Hug Wall. You can have extra work space anywhere in the house or garage by attaching a drop leaf to these sturdy brackets. They come kit-packed with a 1½"-thick work top, or you

can buy the brackets alone for use with a flush door, a piece of wall paneling or a salvaged table top. When the brackets are folded, the table takes up little more space than the thickness of its top.

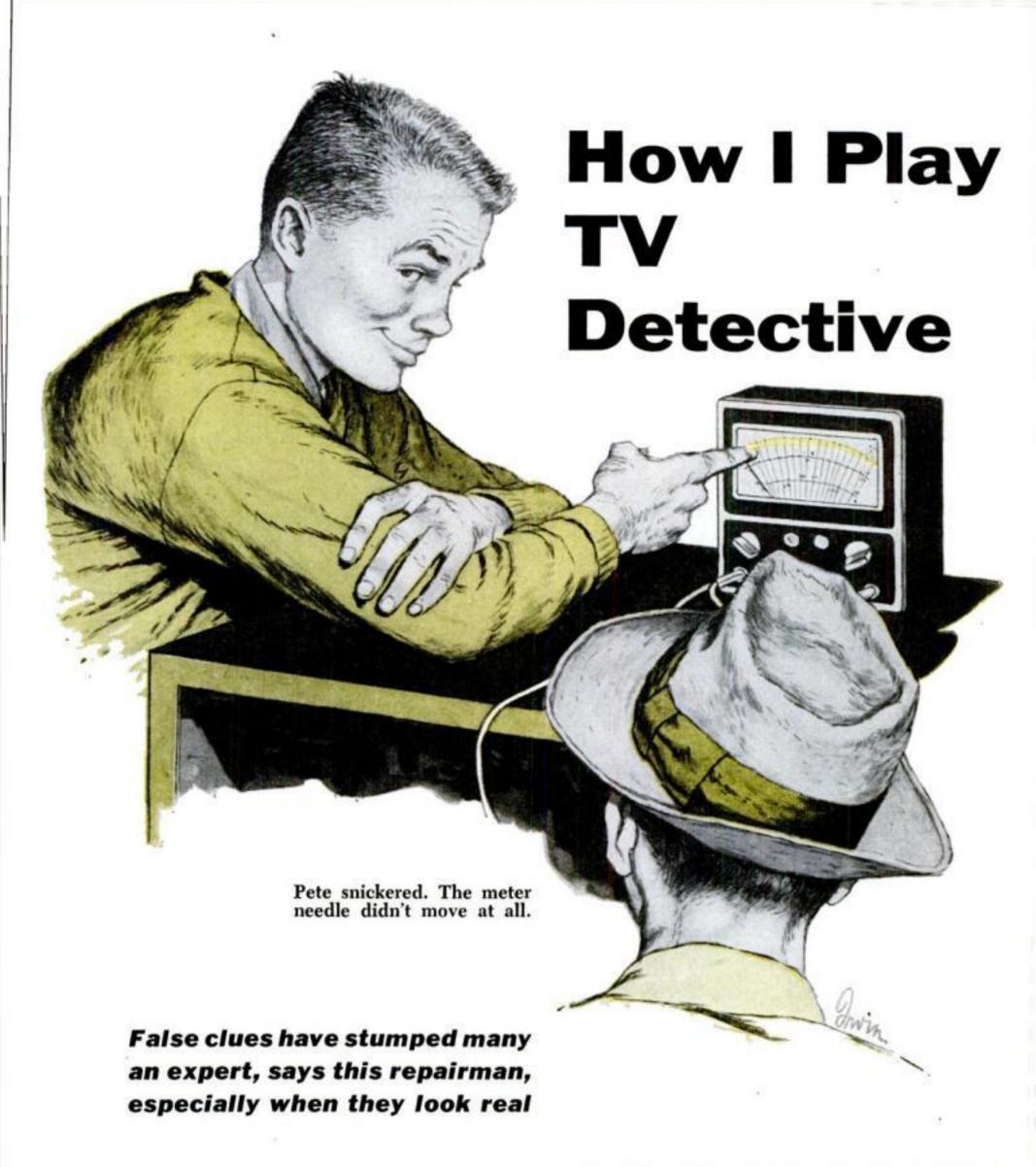


2. Polisher Uses Shop Motor. A floor-polishing attachment has been added to the list of workshop tools that can be powered by the ½-hp. Dyno-Mite power head. And there's a 20-foot extension cord with an in-line switch to give the \$30 polisher a long reach.



3. Peel-and-Stick Tiles. Here's a tile that eliminates working with gooey mastic. You just peel off the paper backing to expose a pressure-sensitive adhesive and stick the square to the floor. The resilient tiles can be laid over any clean, smooth surface, including linoleum.

More information about the products shown on this page can be obtained from: 1. Sturdi-Bilt Steel Products, Inc., 2501 Peterson Ave., Chicago 45; 2. Millers Falls Co., Greenfield, Mass.; 3. Robbins Floor Products, Inc., Tuscumbia, Ala.



## By Art Margolis

Y KID cousin, Pete, whose hobby is looking over my shoulder while I repair TV sets, was doing just that one hot afternoon. I try to explain what goes on while he watches—and talks.

This set was a six-year-old model. The symptoms were plain. No vertical sweep. A thin horizontal line of brightness was the only thing showing on the screen. I double-checked the vertical oscillator and output tubes first. When neither of them cured the condition, I turned the chassis on its side.

Pete started with, "Why don't you check any of the other tubes? Isn't it possible one of them is bad?"

I answered as patiently as I could, "Sure, it's a possibility, but not too probable." A little bit of perspiration rolled

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off my forehead—boy, it was really hot. I turned on the set and began checking voltages in the vertical circuits. I didn't have to go far. There was supposed to be 470 volts DC on pin No. 4 of the vertical-output tube, which is the plate. There were zero volts there.

I demonstrated to Pete with a flourish the zero reading on my voltmeter. Then I showed him on the schematic where the voltage should be coming from. The 470 volts originated in the damper circuit. It was fed to the vertical circuits by way of a winding in the high-voltage transformer, the vertical-deflection yoke and the vertical-output transformer.

Since the voltage had to pass through the three parts and wasn't getting through, it followed that one of the parts had opened up and broken the pathway. I asked Pete which part he thought had

conked.

As I expected from his inexperience, he said, "It looks to me like the flyback

high-voltage transformer."

I said, "You gotta think a little further than that, kid. Of the three parts, it couldn't be the flyback because then there would be no high voltage and no brightness on the screen." I smiled condescendingly.

Then I began the actual resistance reading of the parts. I started with the vertical transformer. It read 740 ohms, as it should. Confidently I read the yoke—and scratched my head. Unexpectedly, it read the way it was supposed to—six ohms.

Pete helpfully contributed, "Check the flyback just for the heck of it." I was sweating now. I ignored Pete and checked all the connections and wires instead on the voltage route. Nothing. I was a detective without any clues.

Pete needled me some more: "Go ahead, check the flyback." Reluctantly I applied my test leads to the flyback connections. Pete snickered. The meter needle didn't move. The flyback was open.

Was my face red!

It turned out that the entire flyback was not open—only one winding was. Normally that would still have killed high voltage, but with the load of the vertical circuits off the damper, the high voltage managed to limp along just enough to light up the screen. Against all experienced judgment, a new horizontal output

transformer weirdly cured the verticaloutput trouble.

According to the book, if a vertical symptom is evident on the screen, I should begin checking the vertical circuits. If a loss of high voltage is the symptom, I should start examining the high-voltage circuitry, etc.

Unfortunately book procedure takes a repairman only so far. The outward symptoms sometimes indicate only where the trouble isn't. The real defect is hidden mysteriously somewhere else, not so easily uncovered. Then it's time to close the book and reason out the situation on your own. I'll show you what I mean with some more cases from my files.



## The Burglarproof TV

OUR local papers had been filled with news about how over \$100,000 worth of merchandise had been stolen over a period of a year from a large manufacturing plant. Then the papers ran a story of how the plant had installed a closed-circuit surveillance system with special TV cameras that were more sensitive than the human eye and could even see in the dark. The thefts came to an end.

I was pleased when they called me for service because here was my chance to see this job in action. The guard explained that there was no light on the screen. I turned on the set and took a reading of the high voltage.

Instead of the usual 10,000 volts in the high-voltage circuit, my voltmeter showed only a few hundred. I naturally began examining the high-voltage circuit.

When the high voltage quits, it shifts the normal voltage readings in the horizontal oscillator, horizontal output and damper circuits. I found the shifted voltages, but no clue to the trouble.

I turned off the set and began to make some resistance readings. I attached my meter ground clip to the chassis and probed the circuits. All matched the schematic callouts till I touched pin No. 3, the cathode of the damper. The meter read 6,600 ohms instead of hundreds of thousands. I followed the lead.

The technique of finding a short goes this way. The wiring is traced point by point toward the short. That means you track toward the lowest resistance. If you cross a resistor and find the resistance has increased, you're going the wrong way. If you find the resistance has decreased, you're going right.

Your ohmmeter is your bloodhound, eliminating all possibilities till you arrive at the short. I left the damper cathode and went over a winding in the flyback. Then to my surprise the trail left the high-voltage circuits behind and headed for the vertical circuits.

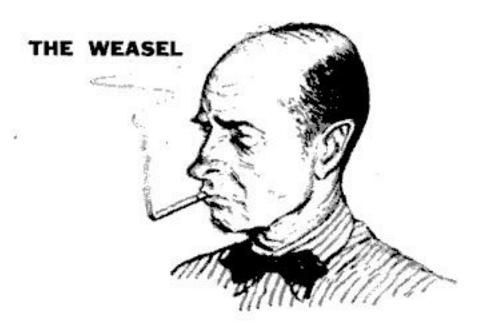
I came to a 3,300-ohm resistor. I bridged it, and the short became 3,300 ohms less. I came to a second 3,300-ohm resistor. As I jumped it, the short went almost to zero. I came to a junction. On the junction was a 40-microfarad filter condenser to ground and the vertical-output transformer. First I disconnected the condenser and measured it. It read fine.

I measured the transformer next. My meter needle jumped all the way across the dial. That was it. The transformer had shorted internally, secondary to primary, and its primary was attached to ground. That effectively shorted out the damper voltage and killed the high voltage. The trouble wasn't where it had appeared to be at all.

I installed a new transformer and two new 3,300-ohm resistors. They had become pretty beat with all the shorted current passing through them.

When the picture returned to the screen, instead of a view inside the plant I was getting a regular network program. I said to the guard, "Hey, where's the closed-circuit input?"

He put his arm on my shoulder and grinned slyly. "You better keep it quiet. We don't have any closed-circuit equipment. The publicity itself was enough to stop the stealing."



## The Diagnosis That Backfired

Y PHONE rang one morning and it IVI was the "Weasel." Nobody knows his real name, but for years he has run the local pool parlor. He's a tall, slim, shifty guy with a deadly fear that some day he might get taken on a deal. He whined over the phone, "Art, tell me-if a TV picture rolls all the time, is that a big job?"

I answered, "Weasel, I can't fix TV

sets over the phone."

Ignoring that, he asked, "Just give me an idea. Is that a serious thing?"

"Not usually, but there are exceptions." "Thanks," he muttered and hung up.

A couple of minutes later he called back and said, "C'mon over, I got a repair job for you."

When I met Weasel, he couldn't contain himself. He had to brag. "I picked this up for practically nothing. I gave the poor jerk I bought it from a snow job —told him it had a bad picture tube. Just give it a quick fix."

The picture had no vertical sync. It rolled continuously. After checking out the sync tubes, I began examining the sync circuits. When I arrived at the 12AU7 DC Restorer-Sync Separator tube, I uncovered a clue. On pin No. 2, a cathode, I found over 200 volts DC. There was supposed to be only a couple of volts. That meant that B-plus voltage was getting past some obstacle and going where it shouldn't be. By examining the schematic road map, I found there were two blocking condensers, a .015 and a .047, that stood between plus 295 and the cathode. If either one of them had shorted, the voltage would have leaked through.

I checked the two condensers. To my surprise they were both good. Then I saw another less obvious possibility. There was plus 375 on the screen grid of the picture tube. If a short had developed between the screen and the control grid, the plus 375 would have a path to the cathode.

I measured the control grid to screen with my ohmmeter. Sure enough, a bad picture tube was causing vertical symptoms. Instead of reading open, it read a dead short. The two picture-tube elements were welded together.

I smiled and said to Weasel, "Well, pal, you made a good diagnosis. It is a bad picture tube."



## Solving the Baby-Sitting Problem

I HAVE a baby sitter now I can depend on. No longer are my wife and I disappointed at the last minute with a party to go to and no sitter to take care of the three gremlins.

It all started when the father of one of my teen-age sitters, Mr. Harrison, called me for TV service. There was a definite loss of brilliance on his 17" set. Everything about the picture and sound was fine, except that viewing could be done only with the shades down and no lights.

The symptoms looked very much like low emission in the large picture tube. That was what Mr. Harrison was afraid of. However, the picture was otherwise-fine. And low emission is usually accompanied by a gassy condition that makes the picture glisten when the brightness is turned up. This glistening was absent.

My picture-tube analyzer confirmed my suspicion that it wasn't the picture tube. It looked as if I had another one of those misleading-symptom jobs. I began by checking the cathode and control-grid voltages that fed the picture tube. They measured exactly right. I checked the screen of the picture tube. Here seemed to be a clue. Instead of a plus 295, as the schematic showed, it read about plus 110.

The schematic showed that the screen voltage was drawn from the plate of the vertical oscillator, pin No. 2, of a 12SN7. I read the plate with my voltmeter. Instead of it being plus 295, it also read 110. The thing that I didn't like about all these clear-cut readings was that there were no vertical symptoms. I've had apparent clues before and after laborious effort found they were typographical errors in the schematic. But since it was the only clue I had, I continued.

I took a voltmeter reading of the 12SN7 grid, pin No. 1. I was amazed to find plus 200 instead of the minus voltage it was supposed to have. With all this wrong in the vertical circuit, I should have had vertical symptoms.

There was a .01 blocking condenser between the voltage-plagued grid and about plus 200 volts. I measured the condenser. It was shorted. I replaced the condenser and the brightness came back on strong. Wow! A short right in the middle of the vertical circuit had done no harm there at all, but had killed the brightness.

The shorted .01 condenser had caused the 12SN7 grid to go positive. The heavy current had lowered the plate voltage. Since the plate was tied directly to the picture-tube screen, its voltage had dropped too, which lowered the brightness level. I knew now I had seen everything.

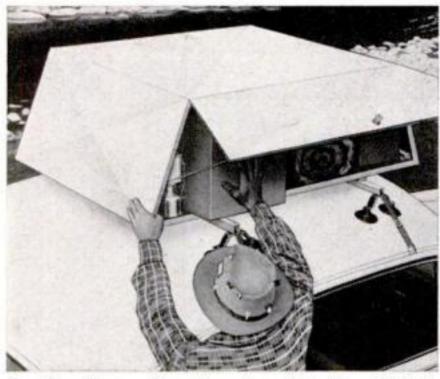
Mr. Harrison was very pleased. Then he asked me, "How about if we swap Janie's sitting services for an equal amount of TV repairs?"

I agreed, but with the firm stipulation that I was not, under any circumstances, to be disappointed at the last minute, for Janie has had quite a rush from the boys lately.

Mr. Harrison said, "Don't worry, a deal is a deal. You'll get a sitter."

He's been as good as his word. I haven't been disappointed yet. Only thing is that Lea, my wife, figures she has seen about everything, too. I come walking in with Mr. Harrison every Saturday night, not his daughter Janie.

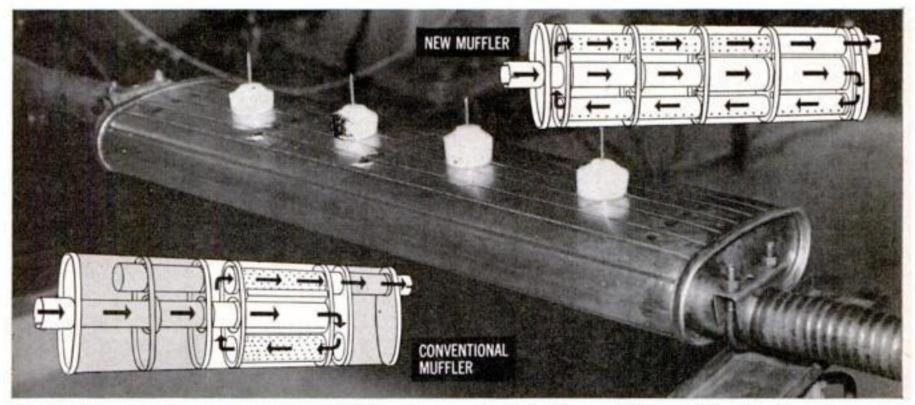
## New for Your Car



1. Car-Top Carrier Is Weathertight. You get more than 14 cubic feet of space for luggage or camping gear in this aluminum rooftop carrier. It's attached to the car top with eight suction cups and four straps, and gear is passed in and out through the side. With one turn of the key a locking bar secures the door at three points. A rubber seal keeps out dust.



2. Install-It-Yourself Car Cooler. No refrigeration experience is needed to put in this air conditioner—you can do the job in about four hours, the manufacturer says. Priced at \$185, the kit contains a compressor, a multi-speed blower, refrigerant, and all parts and connections. The unit is said to lower inside temperature 30 degrees and reduce humidity.



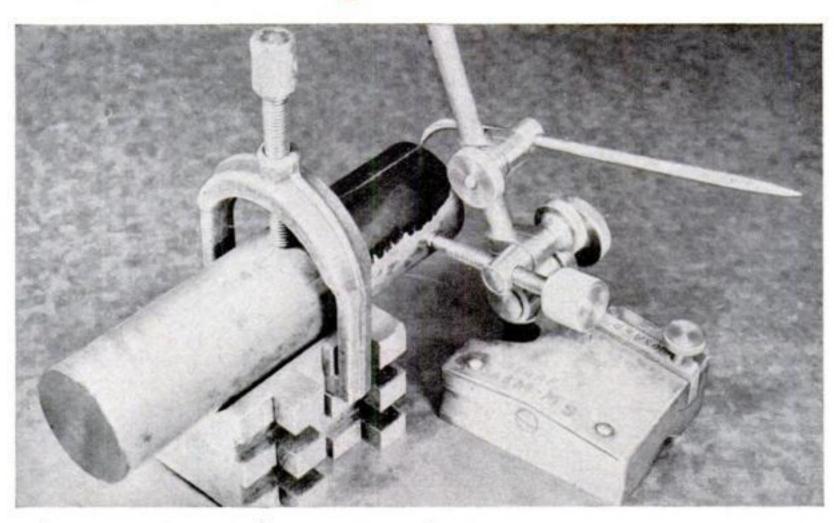
3. Muffler Lasts Longer. By distributing exhaust heat throughout its breadth and length, a new muffler is said to evaporate exhaust vapors before they condense and cause corrosion. The design, its maker claims, extends muffler life 25 percent.

In the manufacturer's test above, candles placed on the shell of a Dri-Flow muffler melted evenly, indicating uniform distribution of heat. In similar tests on other mufflers, the candles melted at varying rates, depending on whether they rested on hot spots or cold areas.

The diagrams show the path taken by exhaust gases in the new muffler and in one of conventional design. The shaded areas in the lower diagram are cold areas where gases condense and accumulate.

More information about the products shown on this page can be obtained from: 1. Stemun Mfg. Co., 3919 W. National Rd., Springfield 12, Ohio; 2. Kool Engineering Corp., 3716 W. Belmont Ave., Chicago 18; 3. The AP Parts Corp., Toledo 1, Ohio.

## PS Shop Notebook

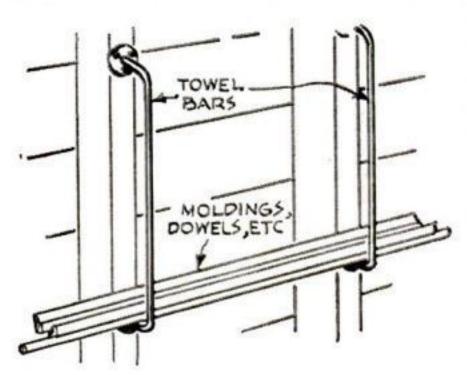


## accurate Shaft Centers

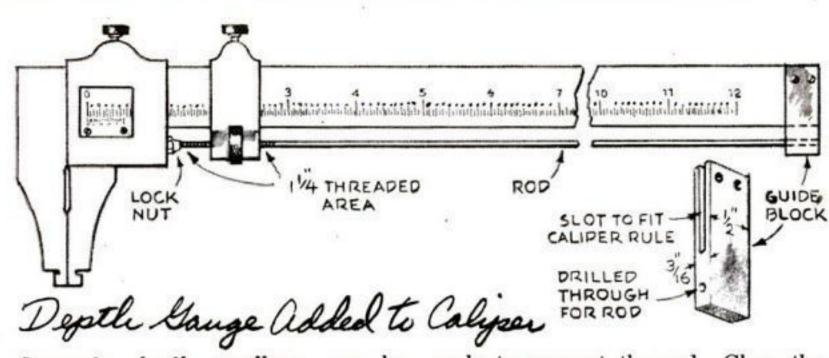
To lay out centers accurately for drilling cylindrical work in a V block, purchase an extra swivel clamp for the surface gauge and thread the scriber hole to receive a knurled thumbscrew. Install it beneath the regular scriber clamp and adjust the thumbscrew to touch the side of the

work when the hooked end of the scriber is centered above it. Turn the thumbscrew in or out until the center-line coincides when scribed from both sides. This will be the exact center and the work should be center-punched and drilled without disturbing its position in the V block.

## Dowels Stored in Towel Bars



A pair of dime-store towel bars screwed vertically to adjacent wall studs provides neat storage for a large supply of dowels or thin molding strips. All the dowels are visible for quick selection and one can be removed from the middle or even the bottom of the pile without tumbling the others into confusion. The bars can also be fastened to the ceiling for storing long pieces of thin lumber or pipe.—Victor H. Lamoy, Upper Jay, N. Y.



Accurate depth readings can be taken with a vernier caliper by substituting a long rod, threaded to match the movable jaw and vernier wheel, for the existing adjusting screw. Machine a guide block and fasten it to the end of the vernier

scale to support the rod. Close the caliper jaws and file the end of the depth rod flush with the end of the guide block. When measuring depth, read the vernier scale as you would when taking an outside measurement.

—J. McGinnis, Saddle Brook, N. J.

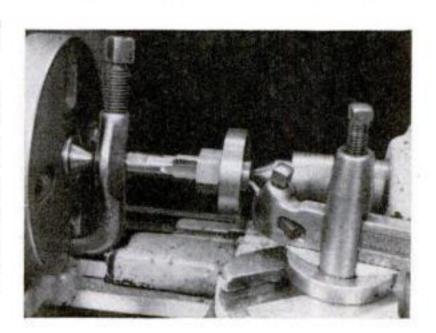
## Tap Doubles as Mandrel

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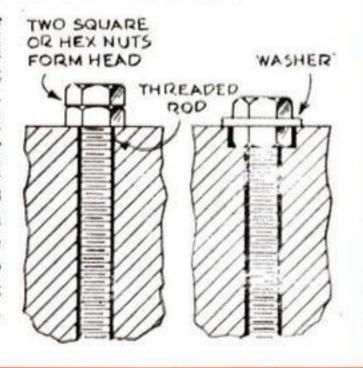
When turning internally threaded work between centers, a tap of the correct size can be used as a precision threaded mandrel. Run a nut halfway up the tap, then screw the work on after it. Tighten the nut against the work to lock it in place and mount the entire assembly between centers on the tap's centerholes.—

H. J. Gerber, Stillwater, Okla.

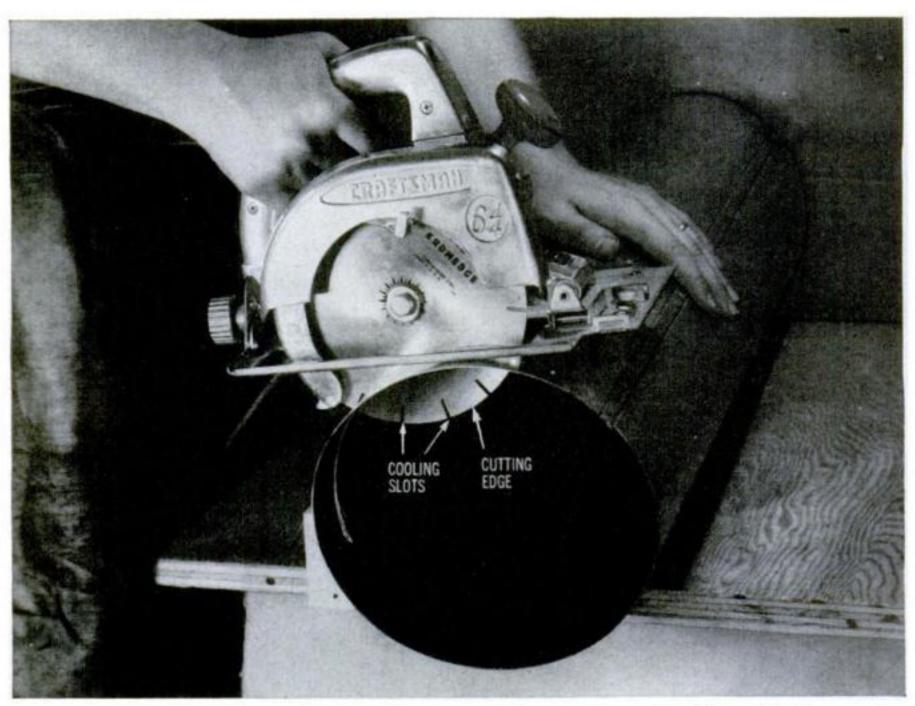


#### HAVE YOU TRIED THIS?

You can make hex-head bolts of any desired length from threaded rod by tightening two nuts against each other on one end. These improvised bolts can be wrenched down as tightly as a regular bolt or cap screw. A washer sandwiched between the nuts (far right) makes a self-locking head similar to that on a carriage bolt. The nut beneath the washer bites into wood or settles into a chiseled recess to keep the bolt from turning when a nut is tightened on the opposite end.



## **New Tools**

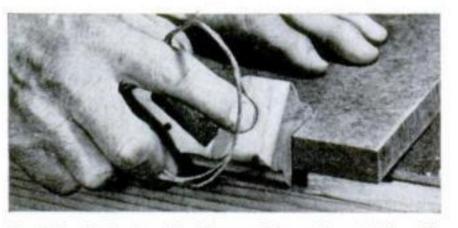


1. Saw Melts Way Through Metal. Heat generated by friction makes this toothless blade slice ferrous sheet metal. Where its edge makes contact, the metal becomes

red-hot so that a kerf is melted away before the blade. Rim slots admit air to keep the friction-generating edge cool. It can be used on bench or portable saws.



2. Double-Duty Flashlight. A plug-in jack with wire leads comes with this flashlight. Snap it into the end cap and you can check wiring, fuses, switches, bulbs, relays and breaker contacts. When a continuous circuit is tested, the light glows. If the circuit is broken or shorted, the light won't go on. Unplug the jack and you've got a regular flashlight.

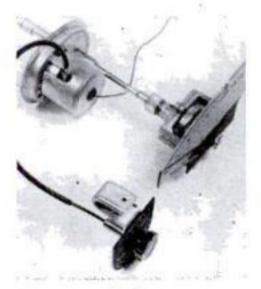


3. Tool Cuts Uniform Bevels. A hard-maple plane, resembling a V block, makes short work of cutting bevels on Masonite and other panels. The carbon-steel blade is adjustable; by advancing it in the V-shaped base, you control depth. To get a bevel of uniform depth and angle, you pass the tool over the panel edge until it ceases to remove any more material.

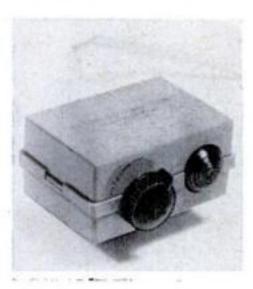
More information about the new tools shown on this page can be obtained from: 1. Sears, Roebuck & Co., 925 S. Homan Ave., Chicago 7; 2. Ray-O-Vac Co., 212 E. Washington Ave., Madison 10, Wis.; 3. Kimball Mfg. Co., 816 University Pl., Evanston, Ill.



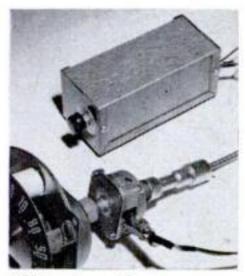
First to have one built in is Buick



You attach this one to any speedometer



All-electronic unit is wired to engine



This alarm is one you can build yourself

## A Message to Car Drivers About Speed Alarms

- At the left are four devices that give a driver an extra sense. We call them speed alarms.
- You set a control on such a device to the speed that is legal and safe for the road you are traveling.
- It signals, gently but insistently, every time you exceed that limit. It is not a governor; you can go faster any time—but not without knowing it.
- Maybe you don't expect to speed. But powerful cars and good roads are making unintentional speeding ever easier. And states are making laws tougher.
- Many of those killed by speeding never knew how fast they were going. They didn't get a second chance.
- A speed alarm does give you a second chance,
   again and again, every time speed sneaks up on you.
- You can expect to hear more, and soon, about speed alarms. We think you should know about them now. They lessen strain, make driving more enjoyable. One of them might save you a ticket, your license, or your life. For the full story about them, see the following five pages.

The Editors of POPULAR SCIENCE

# What You Should Know About Speed Alarms

Were driving within the speed limit, have you been snapped to attention by finding the speedometer way past it? Or come off a through highway, slowed down for towns or secondary roads, and crept up again to the pace you've been conditioned to by fast driving?

On today's fine roads and in modern cars, it can happen to anyone. Yet watching the speedometer means dividing attention between it and highway conditions that demand constant alertness. It may be only good luck that you aren't over the limit when a police car is near.

Saying you didn't realize your speed is no defense in court. Wishing for more time to stop won't give you a split second more when the brakes are down for keeps. The case against speeding is so plain, the record so grim, that most states are getting tough about it.

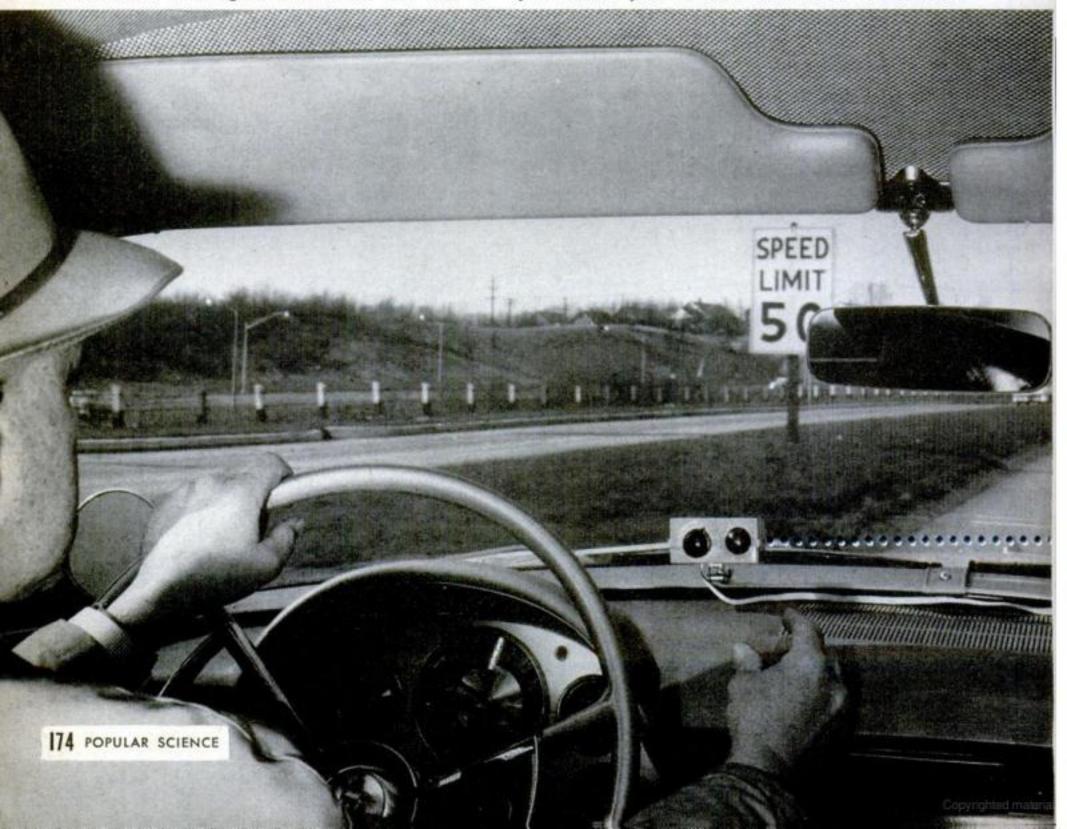
Needed: an automatic conscience that will nudge you when you overstep the safe limit. One such speed alarm is already available on Buicks. You can expect to see more on next year's cars.

There are two you can buy right now as accessories for any car. Another, designed for Popular Science, can be built by anyone with metalworking tools and a knack for such jobs. They aren't costly; even the ready-made ones are under \$20.

Imagine you have such a speed alarm

YOU WATCH THE ROAD, not the speedometer, when there is a speed alarm on the car. It

gives you instant notice when you overspeed, yet leaves you in full control at all times.



on your car as you swing onto a 60-mile turnpike. You switch it on, speed up to 61, and turn the adjustment knob until the bulb lights or the buzzer sounds. Then you drop back to 60. The signal stops.

Now you can drive in a relaxed manner that leaves you free to watch the road and traffic. Your speed is monitored without further thought. You needn't constantly refocus your eyes on the dashboard, or keep uneasy vigil in the rear-view mirror.

The light blinks on or the buzzer sounds over the music from your radio. You ease up on the gas just a trifle, and the signal ceases. You didn't mind being told to slow down; it's as if you had thought of it yourself.

Instead of jockeying around a wide margin both sides of the limit, you can maintain a mile-eating steady speed. Driving is easier. Your eyes tire less. When your exit comes up, it takes only a moment to reset the alarm at a lower limit. Then you can concentrate on traffic; if your turnpike-conditioned foot creeps down on the gas, the alarm tips you off.

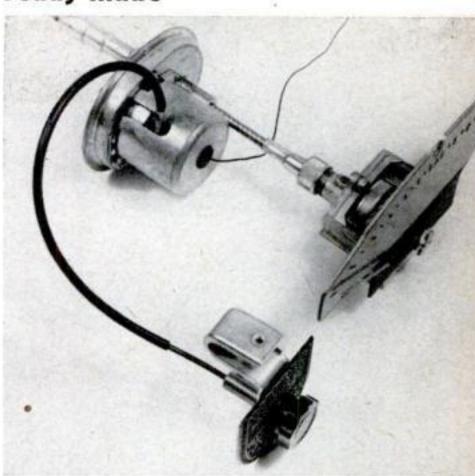
Two you can buy work differently but do the same job. One, an electronic unit, is simplest to install; you hook a threewire harness to the ignition coil and ground, then mount the case under a windshield screw.

Because it counts engine revs, this alarm will go on as you speed up in first or second gear. With automatics, it may give a false warning on hills. It will also give you warning of maladjusted breaker points or a defective ignition coil.

A piggyback speedometer that rides behind the regular one is the brain of the second alarm. You disconnect the cable to insert this unit, and wire the buzzer to your ignition switch. Since this reads road speed directly, it is unaffected by engine revs, transmission shifts or slip.

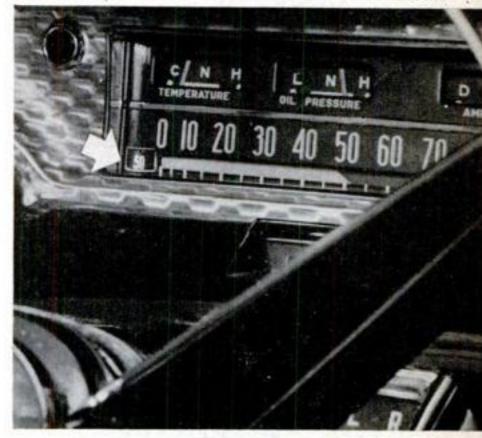
One you can build consists of a cam switch to insert in the speedometer cable, plus a simple electronic circuit that counts cable revs. It's on the next page.

## Here are three you can buy ready-made



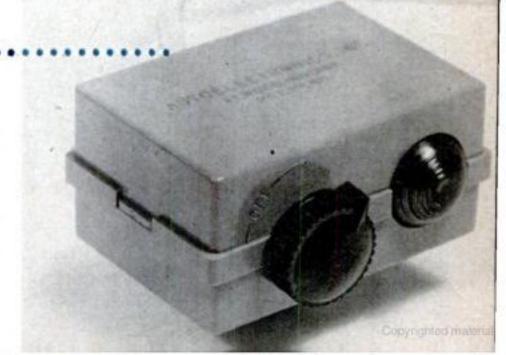
THIS ONE HITCHES A RIDE on the speedometer cable. Magnetic drag pulls contacts together to close alarm circuit. Safe Speed Signal, \$20; All-American Sales, 60 E. 42nd St., New York 17.

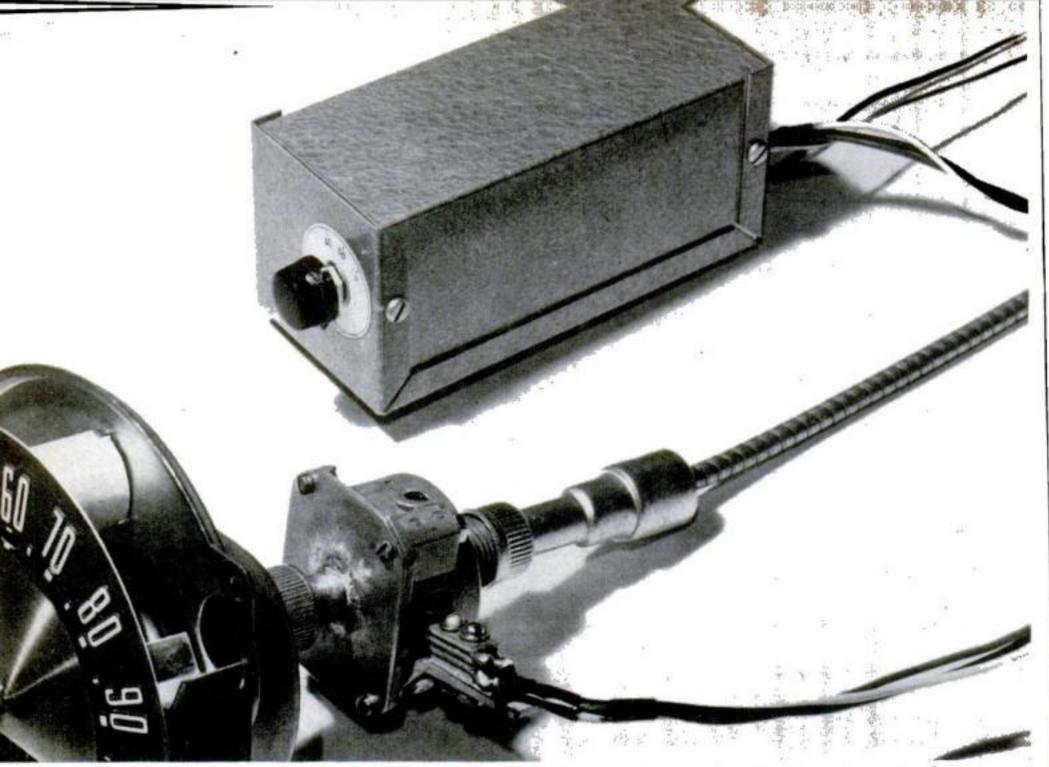
IT COMES WITH THE CAR. You set the Buick Safety Minder so that the desired limit shows in a window (arrow). When the speedometer reaches it, a brush contact closes buzzer circuit.



simplest to install is this electronic speed alarm. It checks road speed by counting spark pulses. Erratic action, says the maker, indicates that your ignition system needs attention. Named Speed-Alarm, it's manufactured by Autoelectronics, Inc., of Elwood, Ind. \$10.

Please turn the page for the alarm you can build





THIS UNIT ISN'T FOOLED by engine revs or transmission slip. The speedometer cable sends

pulses to an electronic circuit. When the pulses start coming too fast, a relay sounds a buzzer.

# A Speed Alarm You Can Build

BECAUSE it reacts directly to road speed, this homemade alarm gives true warnings regardless of transmission shifts or slippage in automatic boxes.

Get an old speedometer and its cable (junked parts will do). Remove the speedometer mechanism and saw surplus metal off the frame, leaving only the shaft bearing and cup-shaped case. Cut a cover plate to fit the open end. Center a hole in this for the cable ferrule.

Remove the shaft (in the speedometer shown, by filing the outer end, which was peened over a washer). If there is a steel thrust ball in the other end, remove it by sawing around the shaft.

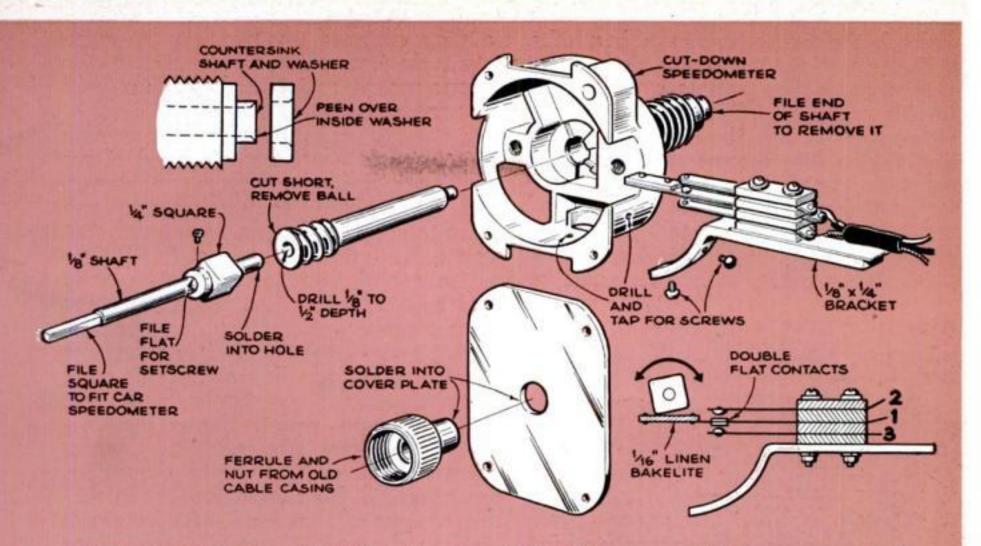
A true, concentric 1/8" hole must be

drilled in this end. Chuck the shaft in a lathe if possible, using a drill in the tail-stock chuck. If only a drill press is available, chuck the shaft by the end to be drilled. Lower the spindle all the way and grip the other end in a drill-press vise. Clamp the vise down, release the shaft from the chuck, and drill.

File one end of a short piece of ½" drill rod square to fit your speedometer (or the square hole in the outer end of the shaft you took out). With acid flux, solder the round end of the new rod into the ½" hole.

Make the cam from \(^1/\_4\''\)-square steel. It need not be shouldered as in the drawing, but its through hole must be on center. Tap for a setscrew, mount on a \(^1/\_8\''\) rod,

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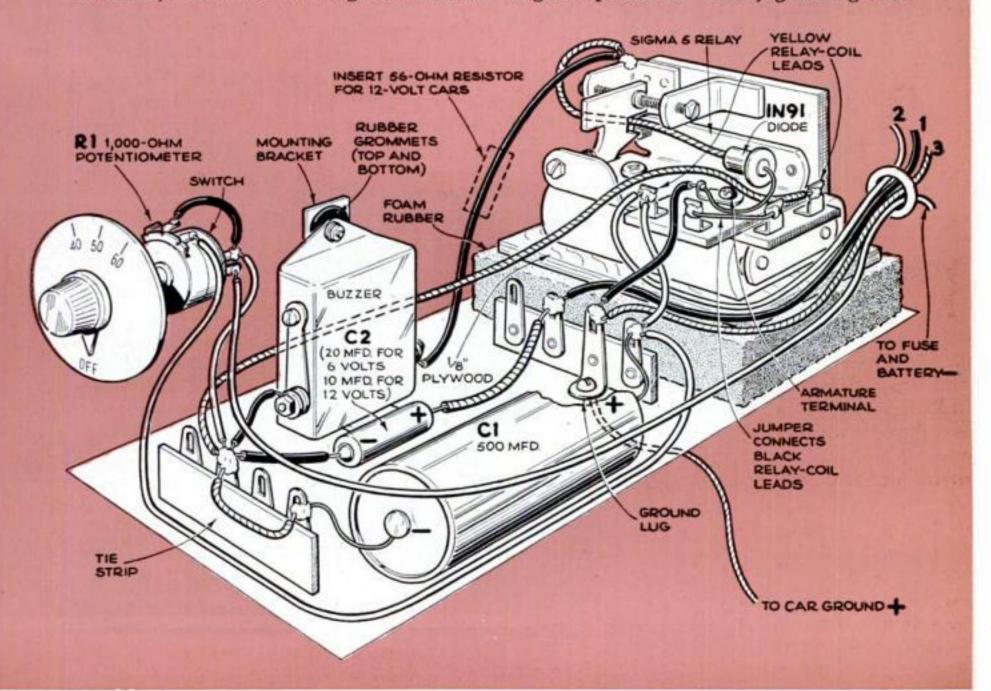


cut the ferrule off an old cable and, with the nut on it, solder it in a hole in the cover, accurately centered on the shaft. File the cover holes long if necessary to adjust

it. Total movement of the center contact is only 1/32". Bend outer contacts so that when it begins to touch either of them, there is 1/64" clearance between it and the other.

HOW IT'S WIRED: Hook relay windings in series by joining black leads with a jumper. If one end of buzzer coil is grounded to its frame, insulate buzzer on grommets. Use

those two of three lugs on RI that give zero resistance with switch off (knob counter-clockwise). Reverse diode and condensers if negative post of car battery goes to ground.

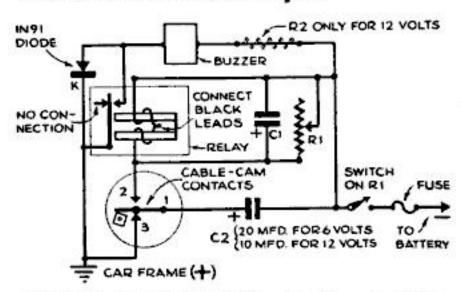


and spin the cam at high speed in a lathe, drill press or electric drill.

Now round the corners by holding a fine file against it. With successively finer abrasive cloth, give the lobes a high polish. File a flat on your shaft extension for the setscrew, positioning the cam within the cut-down case.

Build up the contacts by stacking spring strips and fiber separators on two 6-32 bolts. (A kit of such parts, made for

#### Alarm circuit is simple



INSULATE ALL BARE WIRES with "spaghetti" to avoid shorts. Connect power lead to ignition-switch terminal that is hot only when key is on, or to other live terminal through a fuse.

#### These are the parts you need

Ry: 120-ohm sensitive relay\*
R1: 1,000-ohm potentiometer

with switch

R2: S6-ohm, 1/2-watt carbon
resistor (for 12-volt systems only)

D: GE 1N91 diode

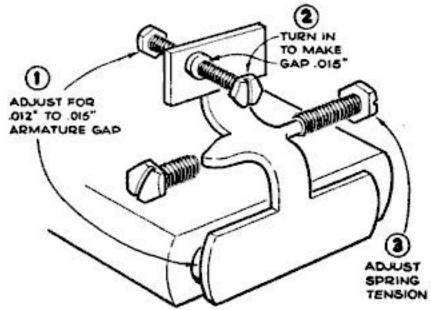
\*Sigma type 5 relay available from Lectronic Research Labs, 715 Arch St., Phila. 6; Gyro Electronics Co., 325 Canal St., NYC 13; Essco, 58 Walker St., NYC 13. C1: 500 mfd., 6 volt electrolytic (15 volt for 12-volt systems)

C2: 20 mfd., 15 volt electrolytic (10 mfd., 15 volt for 12-volt cars) Contacts: Guardian type 200-

M3 parts kit Case: 214" by 214" by 5" (ICA 29439)

Buzzer: Edwards midget
Misc: knob, two four-lug tie
strips, buzzer bracket,
insulating grommets, etc.

## Setting the sensitive relay



ADJUST THE RELAY by following steps 1 and 2. Set spring tension, after installing alarm in car, so that the buzzer sounds at 35 m.p.h. with R1 at low-speed setting (full clockwise).

adding contacts to Guardian relays, is available from radio-parts houses.) To insure snappy action, make each contact of two spring strips.

Put a flatheaded contact rivet through a 1/16" hole nearest the lug end of the two long strips, press a contact washer on the other side of the doubled strip, and rivet together. Mount a roundhead contact on each doubled short strip.

Make a bracket from stiff \(^1/8''\) metal and bolt it on the case. To insulate the long contact from the cam, rivet a strip of 1/16" linen bakelite to it, spacing the rivets so that neither touches the cam. Bend the strip to bear firmly on the cam.

Use a metal case to house the electronic unit and buzzer. The sensitive relay is available from surplus sources for less than \$4. Shock-mount it by attaching a piece of thin wood with bolts run between the coils. Cement 1/4"-thick foam (not sponge) rubber to the wood. Cement the assembly into the case after case holes are drilled and the relay adjusted.

Do not omit the diode, which keeps the relay contacts from welding shut. Connect its wide brim to the positive side of the circuit. (Reverse it and both condensers from the positions shown if your car has negative of battery grounded.)

For 12-volt systems, use a 10-mfd., 15volt electrolytic condenser for C2 and a 56-ohm resistor in one buzzer lead.

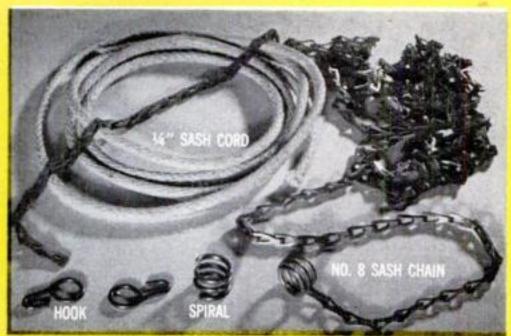
When set for 60 m.p.h., the unit shown cuts out at  $58\frac{1}{2}$  m.p.h. At lower speeds the buzzer may stutter before it cuts out, but at 35 m.p.h. the cut-out difference is only  $\frac{1}{2}$  m.p.h. To make it work at lower speeds, use a bigger capacity for C2.

Stutter can be reduced by doubling the capacity of C1, at the cost of a slight lag in response when speed is changed rapidly. For speeds above 65 m.p.h., make cam contacts of three spring thicknesses instead of two.

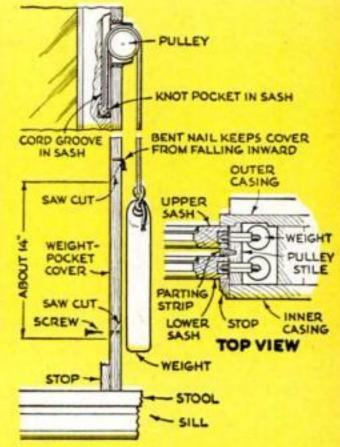
Replace a broken sash cord? You can do this job for the last time by substituting chain for the cord. Chain never wears out or breaks. But if you prefer cord, you'll find tips about that, too, on the following two pages—designed for easy saving.

Next Month: Plumbing drains.

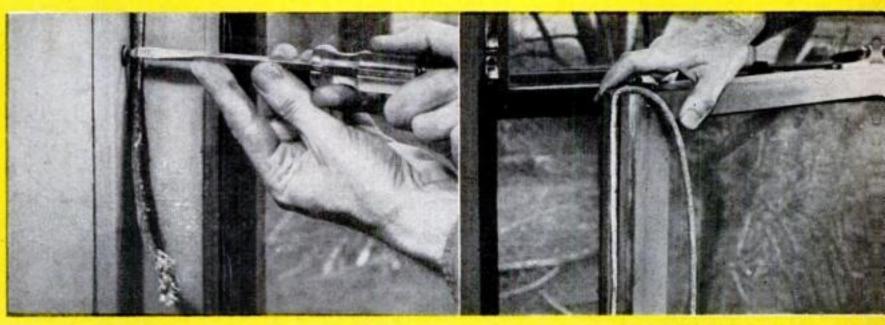
# Popular Science Fix-It File



HERE'S WHAT YOU NEED to replace a broken cord. Chain, hooks and spirals are often offered as a kit. Hook attaches chain to weight, spiral fastens chain to sash and some types of weights. Chain costs more than cord but you'll never have to do the job again.



### How to take the window apart

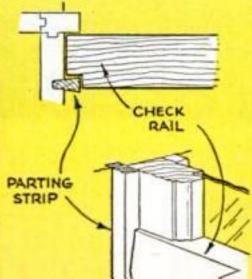


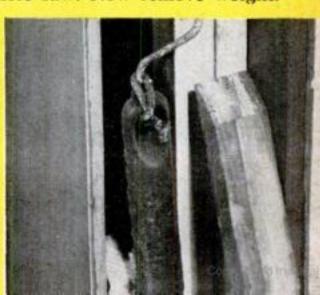
REMOVE STOP STRIP on side of window where cord is broken. If strip is nailed, raise lower sash and pry it loose from sash side. (Stop shown above was fastened with stop-bead screws and washers.) Stop on second side may not have to be removed unless you plan

PARTING STRIPS must come out so you can remove upper sash and replace its cords. Removing these is tricky because the check rail overlaps them (see sketch). With lower sash out, drop upper one to the bottom and use padded pliers to pull top end of parting strip to replace a cord on that side. With first stop removed, see if there's enough play so you can swing lower sash inward (above) and remove cord. Then pull sash sideways from behind opposite stop to free the cord on that side. Set the lower sash out of the way.

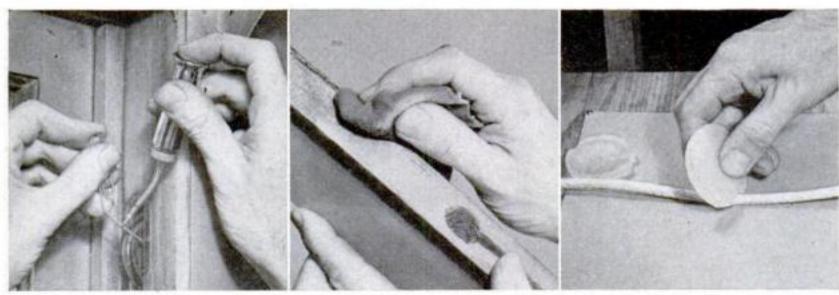
free from its slot. Bend strip until its top end clears edge of casing, then slide it out endwise past the check rail. Pry out weightpocket cover after removing any nails or screws. If cover was never cut free, finish cut with keyhole saw. Now remove weight.







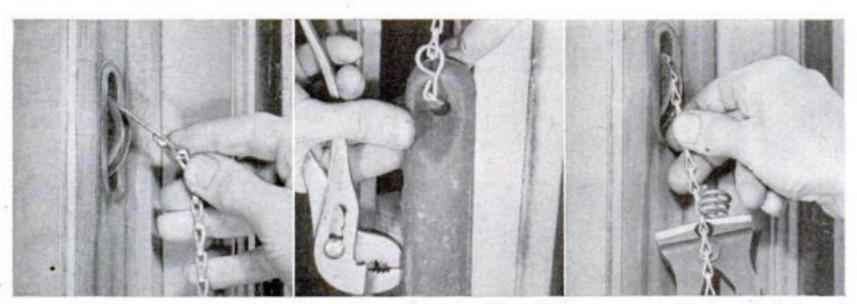
### Now's the time to lubricate the window



TO GET LIGHT OIL to pulley bearings let it travel down a wire of bent paper clip (left). Sand edges of sash, then rub boiled linseed

oil into them as a preservative. If you use cord, coat it with paraffin before installing. Oil chain lightly after it's in place in sash.

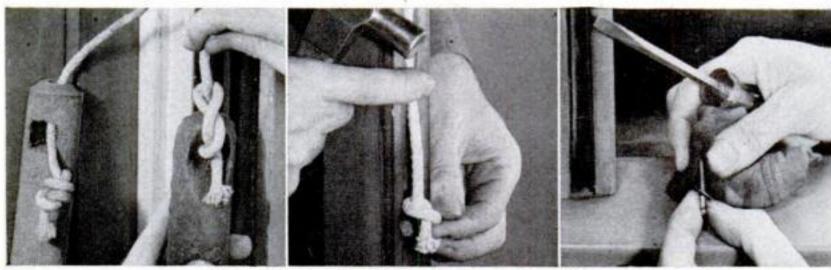
### How to install a sash chain



THREAD CHAIN OVER PULLEY with a piece of wire solder until you can fasten the end to the weight. Use either a sash-chain hook or a spiral, depending on the type of opening in the weight. At center above, a loop through the eye is joined with a hook. For others, a spiral can be pulled into a recess like a knot. To determine chain length, rest the sash on

the sill, pull down on outside leg of chain until weight is up against pulley, and let weight back off an inch or so. Now place a spiral through chain at point where it can fit into the knot pocket of the sash. Clip off the chain below the spiral and put the latter into the knot pocket. Then tack the chain in the slot directly above the spiral.

### How to install new sash cord



end down over pulley. At left, a knot is simply pulled into the recess. For weight like one at right, pull the knot fully tight with pliers. Then pull up weight against the pulley, back off a few inches, and, with the sash resting on sill as for chain, cut cord about three

inches below knot pocket. The knot takes up about 3" of 1/4" cord.

Before replacing parting strips, pocket covers the stops, try out the sash to be sure they go up and down easily. Replacing stops with stop-bead screws and washers (right) will make future removal easier.

# How to Take Care of a '57 Plymouth

### By William Carroll

FTER two years with hydraulic valve lifters on V-8's, Plymouth has returned to mechanical tappets on all '57 engines. For peak performance and a quiet engine, valve lash should be adjusted several times during the first 10,000 miles, then each 10,000 miles thereafter.

Tappet adjustment on the six is .010" for intake and exhaust, set after the engine has warmed up for at least 20 minutes. V-8 intakes are set to .012" and exhaust rocker arms to .020".

Fan-belt adjustment on Plymouths is checked with a straightedge between generator and fan pulley. Apply a five-pound force at the center of the belt, which should deflect only 1/4". Check the mani-



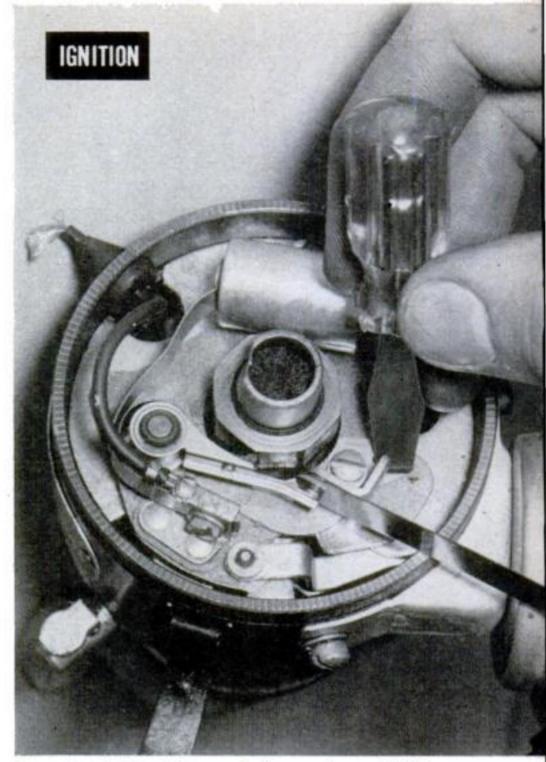
fold heat control occasionally by accelerating the engine momentarily to wide-open throttle. The counterweight should respond by moving clockwise about ½". To free a frozen shaft, lubricate both ends with good penetrating oil and let stand for a few moments. Rotate the shaft back and forth until it operates freely.

Under the 14-psi radiator cap, coolant level should be 2" from the top of the filler neck at normal temperatures. To flush the system, have the engine fully warmed, then drain before loosened sediment settles. There's a drain on the left side of the six, and on both left and right sides of the V-8 block. Another drain is at the bottom of the radiator, while the lower heater hose must be disconnected to empty the entire system.

Breaker gap is set by rotating the distributor shaft until the rubbing block is on a high point of a cam lobe. Loosen the stationary plate lock screw and set the contact gap with a feeler gauge according to specifications (see caption). When low-grade fuels are used, objectionable spark ping may occur with specified timing. To eliminate it, the spark may be retarded, but not more than 4° later than specified. At high altitudes or when using premium gasoline, improved performance may be obtained by advancing the spark, but not more than 4° ahead

of specified timing. A number of carburetors are used on '57's. The six and some V-8's use Ball & Ball units on which the idle mixture is set with the hot engine idling at 450 to 500 r.p.m. Turn the idle-mixture adjusting screw (two on V-8's) until the engine operates smoothly, which is somewhere between 1/2 and 11/2 turns open. The idling-speed screw, below the automatic-choke housing, is identified by a spring around it. Stromberg carburetors found on V-8's have idle-adjusting screws on that side of the carburetor to which the throttle rod attaches. They are identified by a round head as compared with the hex-head fast-idle adjusting screw. Power-Pak V-8's use a Carter four-barrel with a long hex-head idle-speed adjusting screw on the throttle-rod side of the carburetor. Use it to set engine idle to 450 or 500 r.p.m. before you worry the idle-mixture adjustments.

Plymouth's 12-volt battery, located in

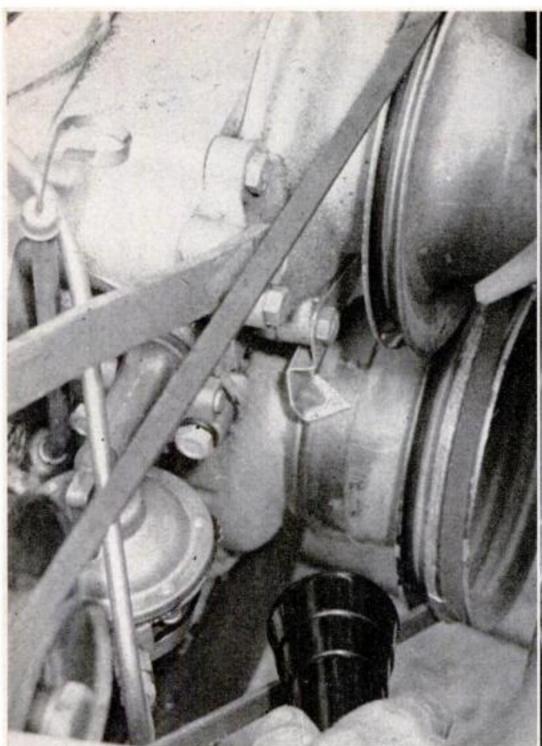


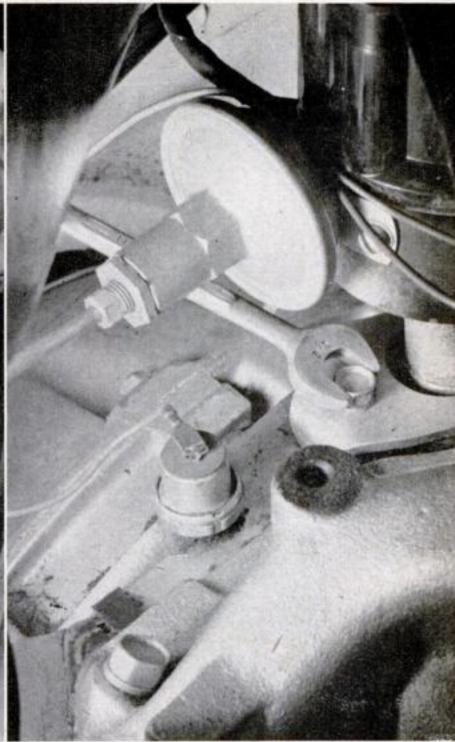
open. Loosen screw behind the points and shift the supporting plate to get .020" gap on the six or .018" on V-8's, then tighten the screw. Each 1,000 miles, put a few drops of light engine oil in the oil cup shown at left.

the engine compartment, is fully charged at a specific gravity of 1.260. Do not tighten battery-carrier hold-down bolts more than finger tight, or tension on the battery support plus engine heat will cause the case to deform. Occasionally dirt and dust on the generator commutator will reduce electrical output. It is cleaned while the generator is turning, with a piece of wood and strip of 00 sandpaper (use nothing else) held against the commutator.

Beauty care for a Plymouth begins with stainless-steel and chrome-plated parts. Chrome cleaner and an occasional application of paste wax restore the luster. Body finish is a high-gloss baked enamel which should be washed regularly with plenty of cold water.

The manual-sceering unit requires no





TIME IGNITION after setting points. Clip timing light to No. 1 (left front) spark plug and aim beam at marks on harmonic balancer. Standard settings are 2° before top dead center on the six, 4° before top dead center on V-8's, earlier if high-test gasoline is used.

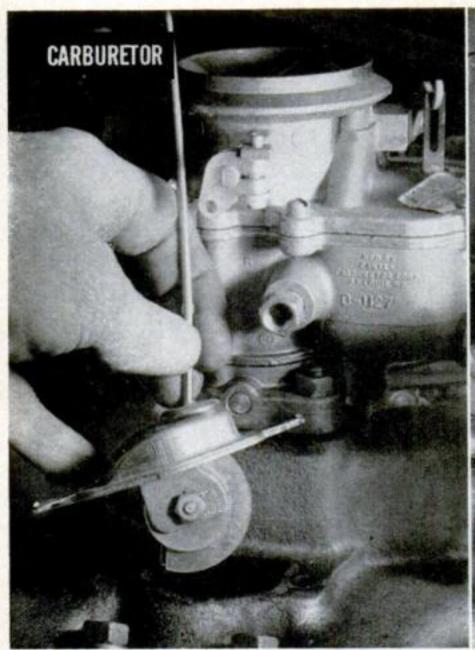
TO CHANGE TIMING, loosen the clamp bolt beneath the distributor and rotate the body clockwise to retard, counterclockwise to advance. Recheck the timing after tightening the clamp bolt and throttle the engine lightly a few times to check the automatic advance.

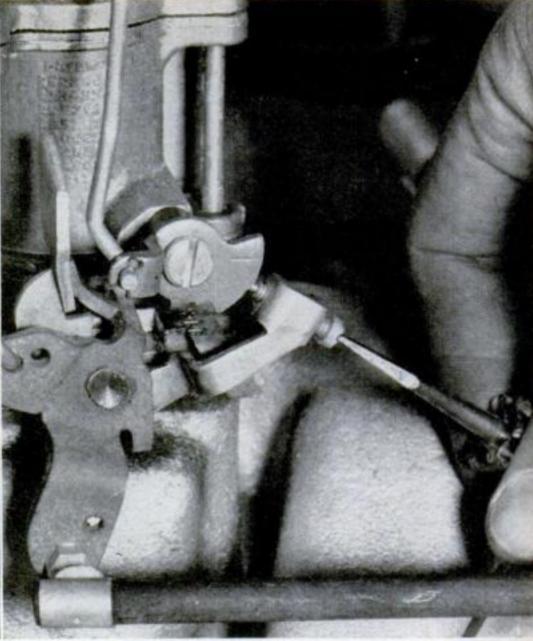
home adjustment. The power-steering hydraulic reservoir holds  $3\frac{1}{2}$  pints of Type A transmission fluid which should be checked each 1,000 miles and replenished to the Full mark as necessary. Before removing the reservoir cover, wipe the housing so no dirt can fall into the fluid. Do not remove or disturb the filter element.

Plymouth brakes have contoured webs which allow great flexibility of shoes to match expansion of hot brake drums. The front brakes are adjusted by turning each adjusting cam on the backing plates in the direction of forward rotation until the lining is locked against the drum, then backing off until no drag is felt. The forward rear-wheel adjusting cams are also rotated in the direction of forward rotation and backed off, as on the front-

wheel brake shoes. On the other hand, the rearward facing brake-shoe adjusting cam on the rear wheel is rotated in the direction of reverse wheel travel. Set the lining solidly against the drum, then turn the cam slowly in the opposite direction until no drag is felt. The brake master cylinder is checked each 5,000 miles and only S.A.E.-quality brake fluid added as necessary.

Under normal driving conditions, engine oil should be changed every 2-3,000 miles in sixes, while V-8's can extend the interval to a maximum of 5,000 miles. If oil on the dipstick is between "Add Oil" and the "Full" mark it is not necessary to add oil. At or slightly below the "Add Oil" mark, only one quart is called for. Draining an engine while oil is warm from at least 30 minutes' driving will re-



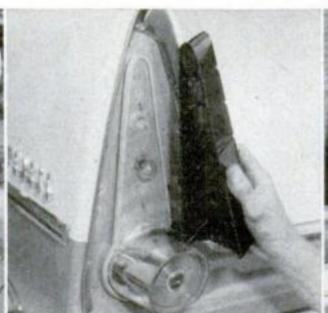


PLYMOUTH CHOKE CONTROL is in the manifold where the heat is, eliminating need for piping the heat up to the carburetor. The unit fits in a well cast in the exhaust crossover passage and must be removed for adjusting to "rich" or "lean" position. Be sure to turn the adjusting plate gradually, only one mark at a time, because the unit is very sensitive.

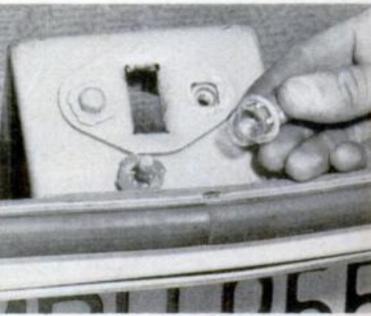
FAST-IDLE ADJUSTING SCREW is set with the engine cold. Turn it against the choke-controlled fast-idle cam so that the engine idles fast enough to keep from stalling when cold. As the engine warms, the choke rotates the cam away from this screw and the spring-loaded screw on the throttle bracket takes over to control the Plymouth's idling speed.



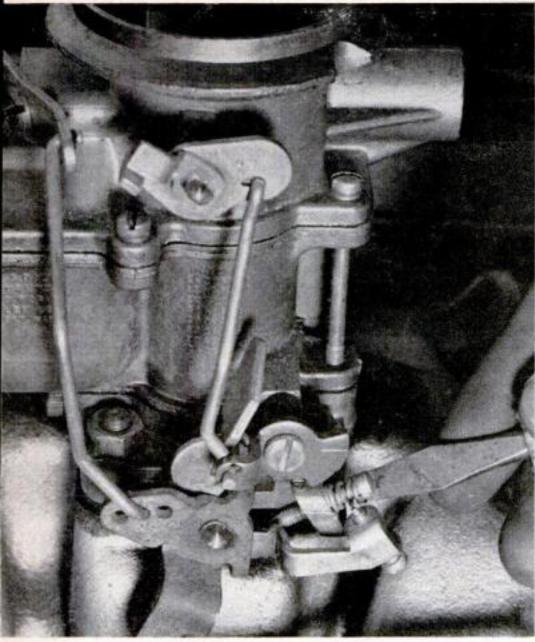
PLYMOUTH'S DUAL HEADLIGHTS aren't really duals. They're a double-header arrangement of headlights and parking lights. To replace headlights, remove trim plate and loosen the slotted screws holding the trim ring in place. Don't touch Phillipshead screws; they're for aiming. Parking bulbs are replaced by removing three screws holding plastic lens to the trim plate.

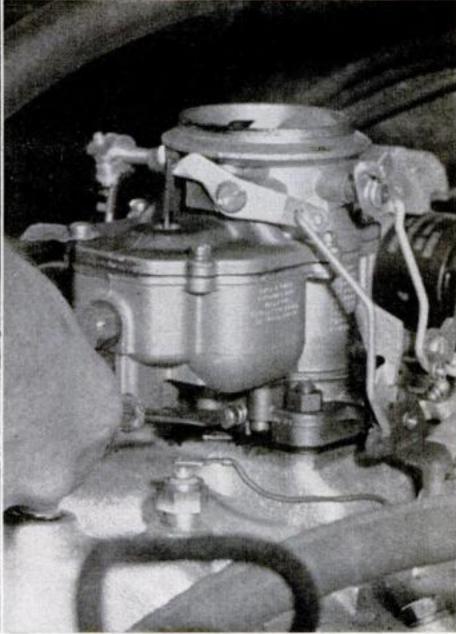


TAPERED TAIL-LIGHT LENS is removed by taking out two screws from inside the trunk. The lens is then pulled from beneath the overlapping rubber sealing lip to expose the stop-, tail- and directional-light bulb. The back-up light (special equipment) lens can also be replaced when the red tail-light lens is removed. Be careful not to overtighten the holding screws.



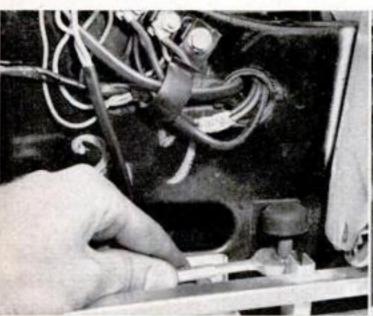
to reach. You just pull the bulb socket from its mounting bracket. Spring tabs hold it when you snap it back in place. The lights are protected by a circuit breaker on the headlight switch. Oversize holes in the latch plate permit you to make an adjustment in any direction to suit the striker position on the deck lid.



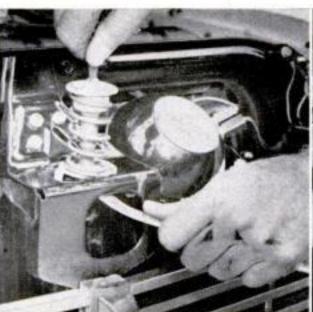


WHEN ENGINE IS WARM, turn the springwrapped screw in or out to obtain a smooth, slow idle with the automatic transmission in Drive and the brakes set. The bracket at left has holes for varying the accelerator-pump stroke. Use the left hole in winter, the right hole in summer. The middle hole is a compromise adjustment for all temperature conditions.

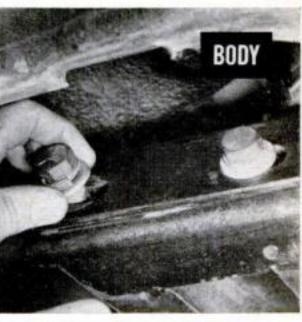
at the base of the carburetor beneath the float bowl. Turn them in equally until the engine skips, then back them off until it rolls. Finally, turn them in slowly until the idle is smooth. Usually, the adjustment procedure ends with both screws open about the same amount—somewhere between ½ and ½ turns.



rit of hood when closed is controlled by a rubber-covered adjusting screw at each corner of the leading edge. Turn these screws in or out to match the hood to the contour of the fenders. Check the screws first if you feel the hood is weaving or rocking up and down when the car is in motion. While you're at it, tighten those terminal-strip connections.

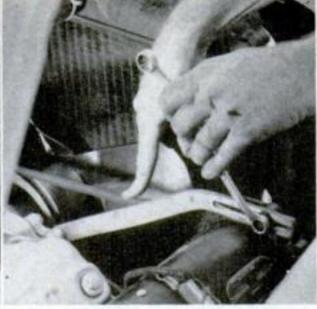


ADJUST THE HOOD STRIKER after the hood cushions have been set to their proper height. Loosen a locking nut under the supporting bracket and turn the striker in or out to lower or raise it to a point where it holds the hood snug against the rubber cushions. Tighten the locking nut and try closing and opening the hood latch before considering that you've finished the job.



plymouth's bumpers are mounted on brackets with elongated holes—a convenience designed to permit shifting of the bumper so it is equidistant from the sheet metal on each side. Bumpers can be leveled by loosening the assembly bolts holding the chrome to the frame rails. You use a jack to raise the bumper to level height, and then tighten the bolts.







solid lifters are back on all engines. Adjust clearances with the engine hot and idling. Remove the V-8 rocker-arm covers and pull hard with a box wrench to adjust the self-locking rocker-arm bolt. On the six, remove the side plate and use two wrenches—one wrench to keep the tappet from turning, the other one to turn the self-locking adjusting screw.

belt drives the fan, water pump and generator. Loosen the bolt on the slotted bracket and move the generator outward until the belt can be deflected 1/4". Another belt runs from the crankshaft pulley to the power-steering pump on the left side. Loosen a lock bolt and pivot the pump upward until only 1/8" deflection is obtained.

OIL-FILLER CAP (located on the left rocker-arm cover) should be cleaned in solvent frequently to provide adequate ventilation of the crankcase. The finger is pointing to the filler tube for the power-steering reservoir. Check the level every 1,000 miles and replenish if necessary to the Full mark on the side of the tube. Use Type A transmission fluid. It holds 3½ pints.

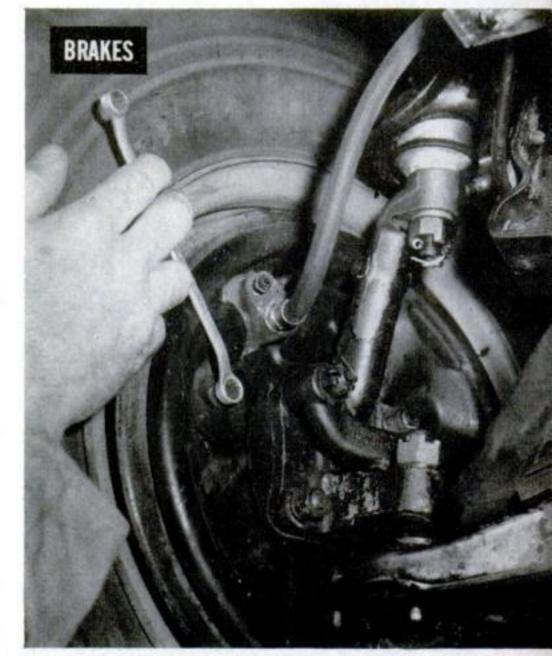
move most of the sludge and sediment that attaches to the oil-pan walls.

A new oil filter should be installed at least every 5,000 miles, or more often in dusty areas. The filter on a V-8 is on the engine block and is removed from underneath the car. Reach down from under the hood to loosen the retaining bolt, knock the can loose, and let oil drain past the loosened bolt before removing the can and filter. Six-cylinder engines have a filter reached from above. A central bolt holding the container cap is released, the cap removed, and the filter lifted out of place.

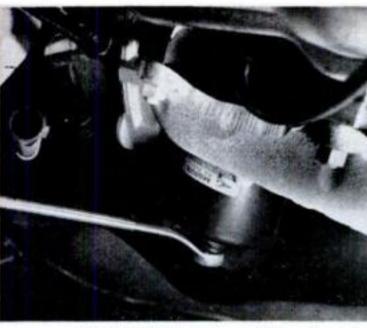
Remember, it takes an additional quart of oil when installing a new oil-filter cartridge.

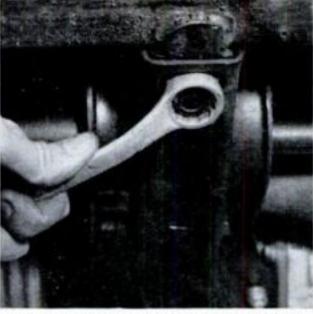
Checking automatic transmissions (only when hot) is begun by applying the parking brake while the engine idles. Operate every pushbutton, pausing momentarily at each position and ending with the "N" (Neutral) button pushed in. Add fluid if the level is not at Full, but do not overfill.

Plymouth cautions that the rubber bushings on their cars are designed to grip contacting metal parts firmly and operate as a flexible medium between these parts. Use of any lubricant destroys the necessary friction and may cause premature failure of the rubber parts.



for detailed instructions.) Cams limit brake-shoe return and hold them close to drums for minimum pedal travel when applied. Two cams on each front wheel and the forward cam on each rear wheel are turned toward front of car; rear cam on each rear wheel is turned toward back of car to take up on the adjustment.



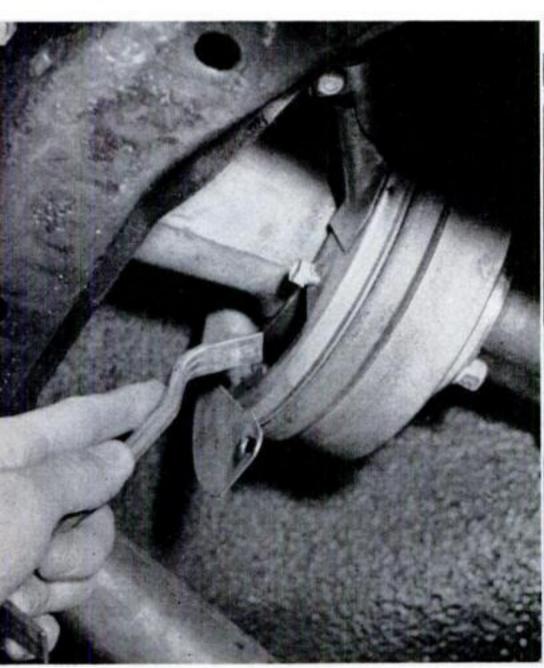


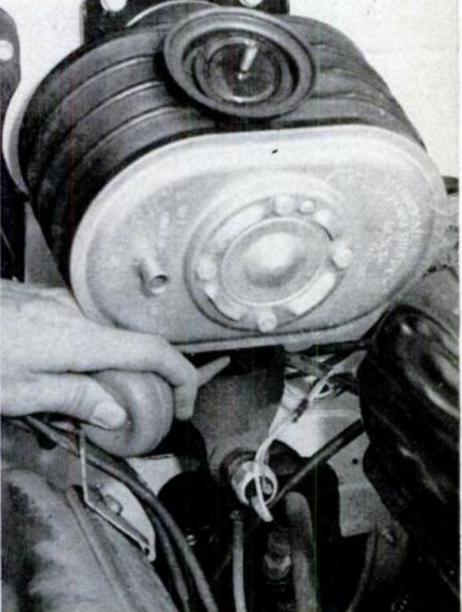


manifold on the right side of the engine. The cartridge should be replaced every 5,000 miles (that's when you change the engine oil in the V-8). Loosen the nut one turn and tap the container until it comes free of the block. Allow the oil to drip into a pan on the floor until it stops, then remove the container and replace the cartridge.

NEW TORSION-BAR SUSPENSION on front end is best left alone, but an adjustment can be made by car owners to keep the car level. Adjusting bolts are on anchor brackets on each side of the frame just aft of the transmission. Turning them will raise or lower the car. Raise the low side instead of lowering the high side or you may have to have the wheels aligned.

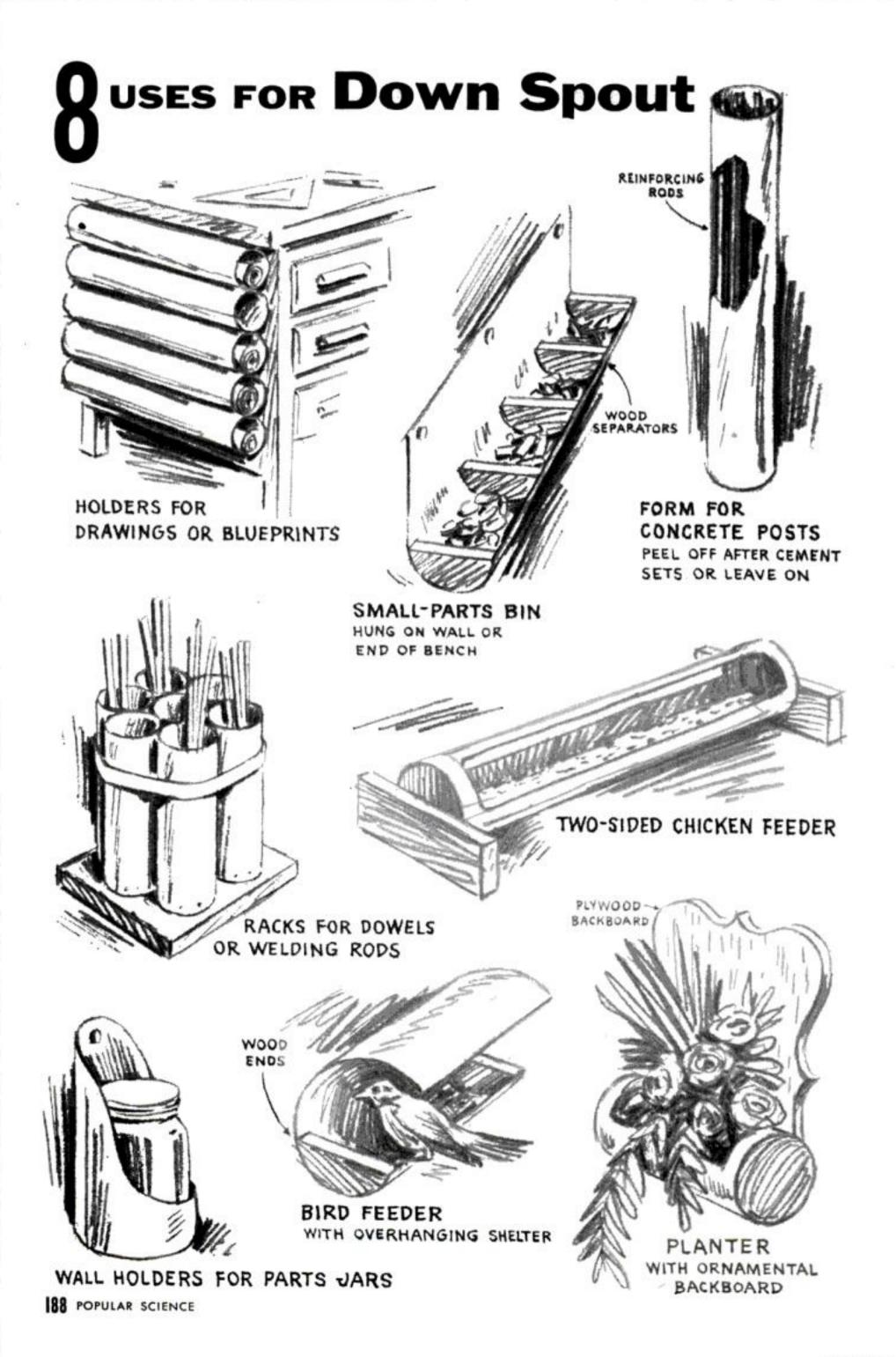
WHEEL-BEARING ADJUSTMENT is new. Remove the grease cap, pull out the cotter pin and slip off the nut lock. Tighten the spindle nut to 90 inch-pounds or until the wheel drags. Then place the nut lock over the nut so that its slots line up with the cotter-pin hole, and back it off just one slot. Finally, install a new cotter pin and bend its ends over the spindle.



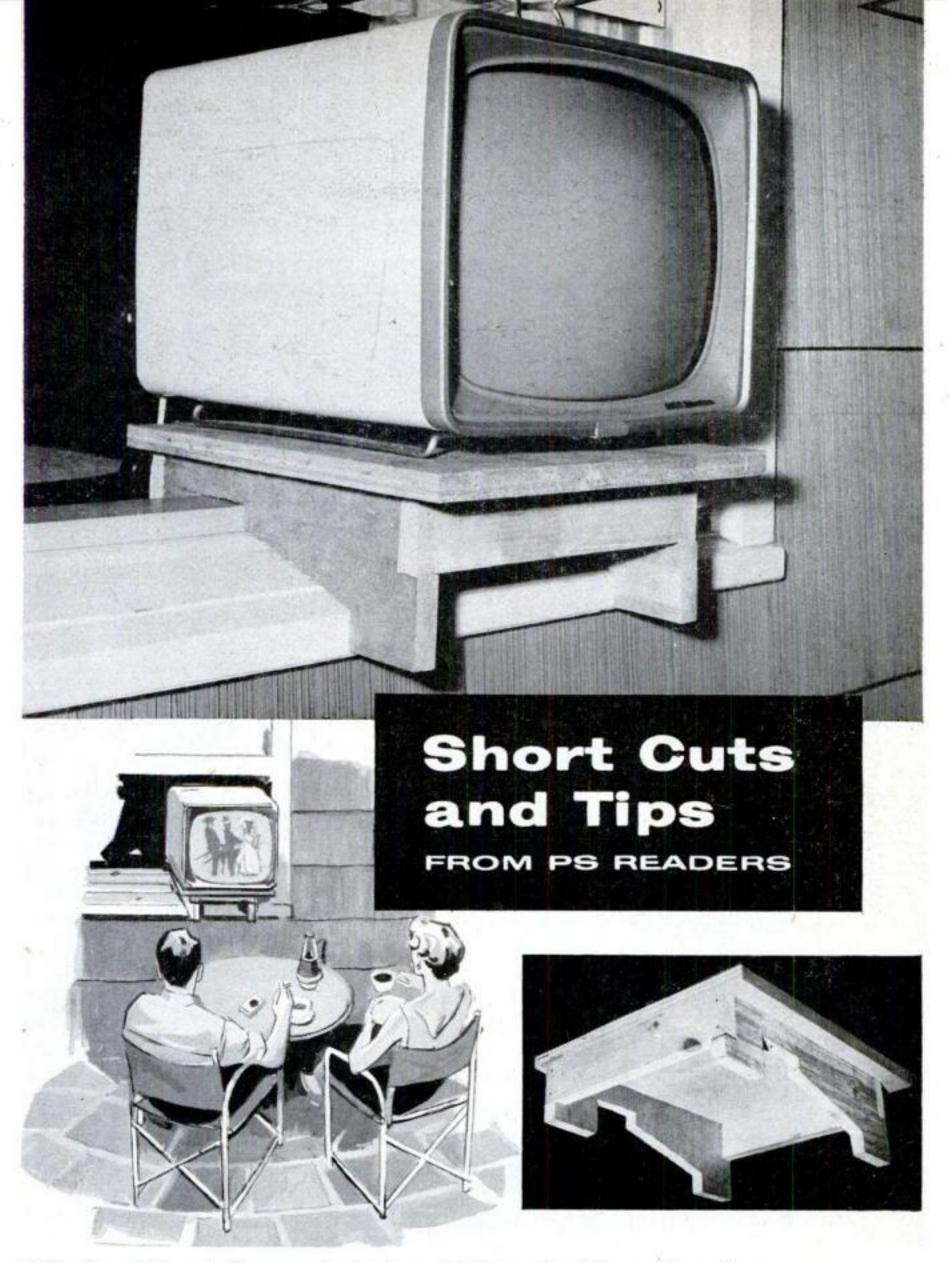


PARKING BRAKE on automatic-transmission cars is internal-shoe type. Remove the cover plate and turn the star wheel until the lining drags on the drum, then back it off until it's free. With one rear wheel jacked up, the drive shaft can be turned with one hand while you adjust the brake with the other. Replace the cover plate after making the adjustment.

above the steering column. Before adding fluid, clean all dirt from around the filler cap and from the bottom of the power cylinder (if so equipped)—then grit won't drop into the reservoir. A rubber syringe, as pictured above, is a useful device to help you get fluid in under the overhanging power cylinder.



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### Window Stand Converts Indoor TV for Outdoor Viewing

My Newly screened porch made a fine place to spend summer evenings. But lugging the TV set back and forth—with wires trailing behind—seemed like too much work. So I made a window stand.

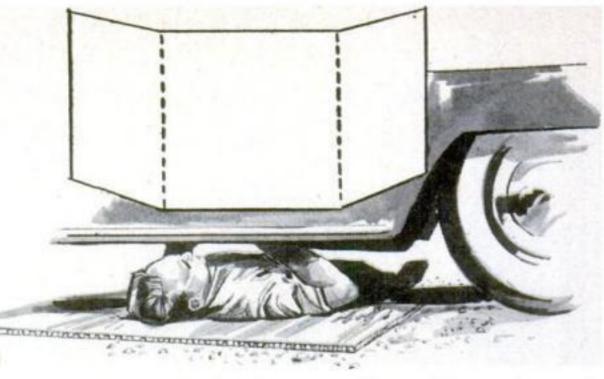
Notching the vertical supports to fit the sill was the only tricky part. I laid a board on edge across the sill and marked vertical lines for each window stop. These I connected with horizontal and sloping lines, gauged by sliding a compass along the sill. After jigsawing the notches in the board, I marked the top line with a level.—
Henry Weiman, Norwalk, Conn.

# Short Cuts and Tips

### Cardboard Pads Save Work Clothes

I KEEP a couple of big pieces of corrugated cardboard to lie on when I work under my car. They pad the hard garage floor or driveway and are smoother

to slide on when I change position. To store the sheets, I fold them into thirds



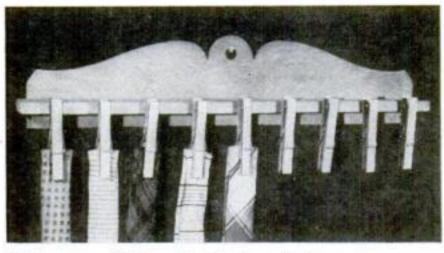
and tie them together with a piece of cord.—R. V. Thompson, Clinton, Iowa.

### **Guide for Electric Drill Keeps the Bit Headed Straight Down**

DRILL SPOOL HOLES S

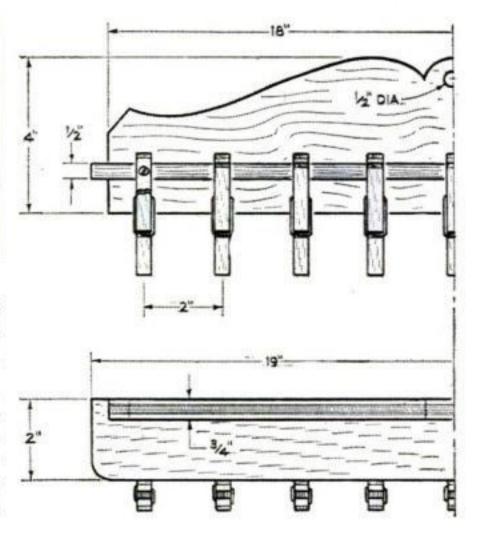
EVER try drilling an accurate perpendicular hole with an electric drill? A guide formed from a typewriter-ribbon or adhesive-tape spool makes more exact drilling possible. Drill through both flanges of the spool with the bits you use most often, making certain that the vertically paired holes are exactly opposite.—John A. Comstock, Wellsboro, Pa.

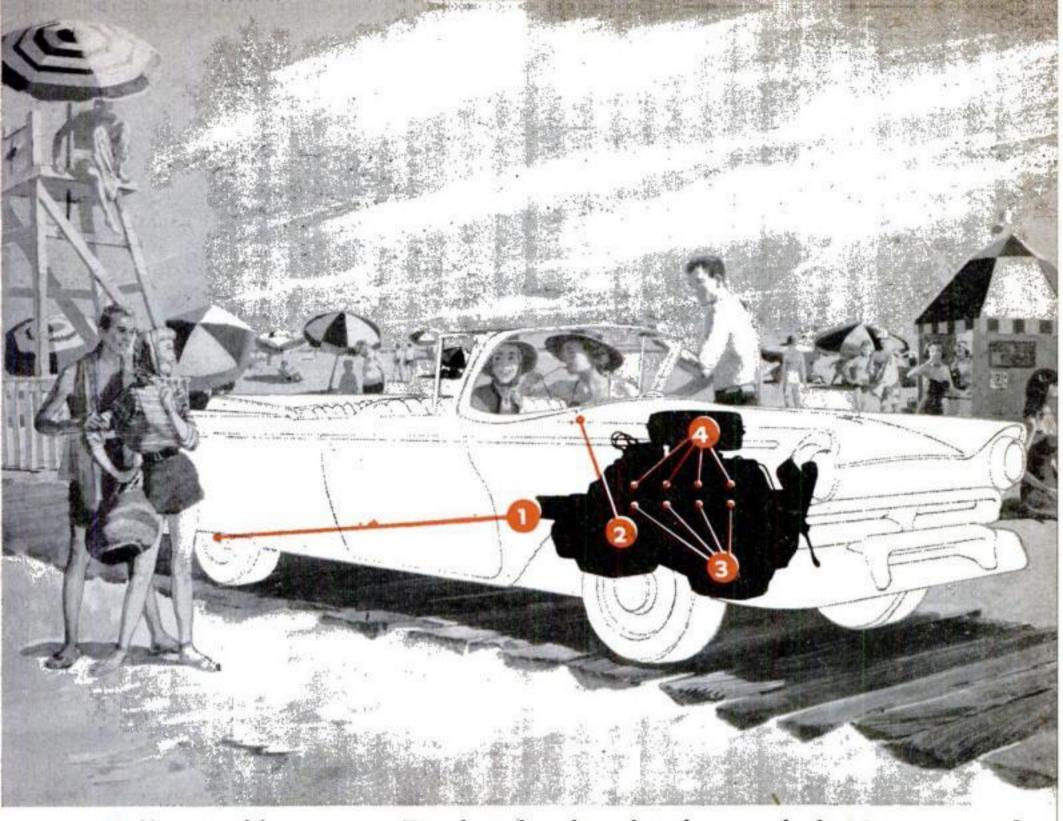
▶▶▶You won't get a good bond when patching a crack in a plaster wall unless the crack is wet down well. To do this job, I fill a water pistol, make the crack my target, and get penetration no paint-brush can match.—A. S. Green, Chicago.



### **Plywood Rack Grips Ties**

Spring clothespins on the crossbar of this hanging rack hold neckties firmly and allow a quick selection. Cut the two rack parts from plywood on a jigsaw. Take apart nine clothespins and drill a hole near the upper end of one grip on each. Fasten these grips to the crossbar with wood screws before reassembling pins.—A. H. Koeppner, Dearborn, Mich.





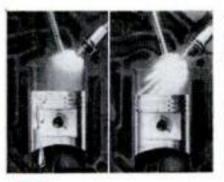
More road horsepower—Tests by independent engineers proved new Champions give cars of all makes an *immediate* boost in road horsepower—the real power actually delivered at the rear wheels. Most cars gained from 6% to 31%! No wonder 9 of 11 cars that broke the Indianapolis speed record this year were powered with Champion spark plugs!

If you haven't changed your plugs in about 10,000 miles —

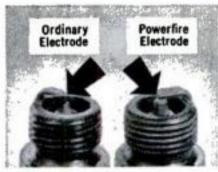
# You can make your car 4 ways newer with Champion spark plugs



Quicker starts—
Tests with cars
whose plugs had gone
10,000 miles or so show
that new Champions
can cut starting time by
as much as 71%— with
an average of 39%!



Old, misfiring plugs (left) dilute oil with raw gas. New, full-firing Champions (right) protect the oil. When you change oil, check your spark plugs!



Lower cost-per-mile

-As photo above shows, Champion's great new Powerfire electrode stands up better than ordinary types under same use. Insist on 5-rib Champions!



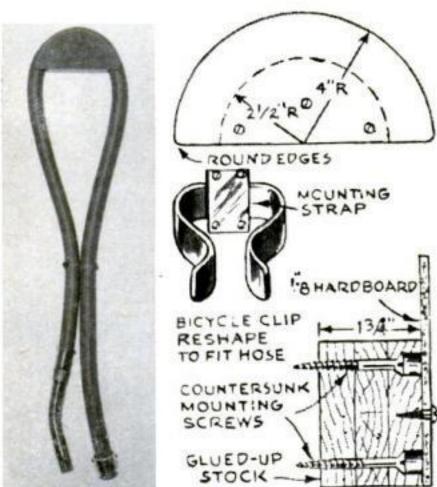
# Short Cuts and Tips

### Rolled Newspaper Makes a Pointer

NEED a pointer for an illustrated talk? A rigid paper wand will serve just as well as a wooden one.

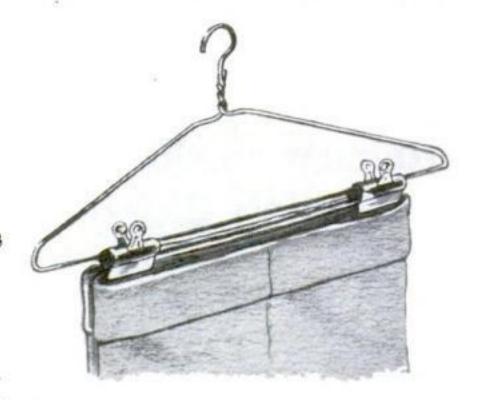
Open a section of the paper at the center fold and, starting with a corner, roll several sheets toward a diagonally opposite corner. As you wind, gradually tighten the spirals at one end to taper the wand. Fasten the outer spiral with tape.—George Glowaty, NYC.





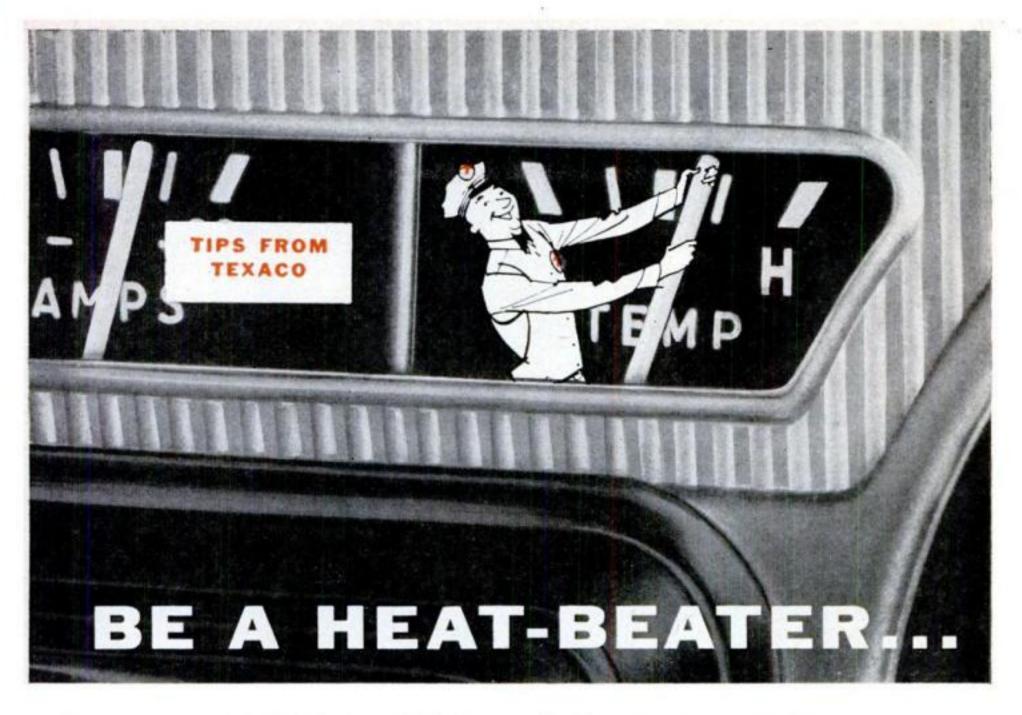
#### **Rack Stores Vacuum Hose**

We store our vacuum-cleaner hose on the inside of a closet door. It hangs on a block of glued-up stock faced with a semicircle of hardboard. The projecting lip keeps the hose from sliding forward to the floor. A reshaped bicycle clip, mounted below the block, grips the hose ends to prevent sideslip when the door is opened.—C. A. Phillips, Corning, N. Y. ▶▶▶I USE a small plastic sponge to apply a protective film of oil to tools before they are put away. This is much better than the old method of using an oil-soaked rag. I keep the lightly oiled sponge in an airtight glass jar when it is not in use.—John A. Coombs, Philadelphia.



### Paper Clips Grip Pants

When you are traveling, tuck several pairs of spring-grip paper clips into your suitcase instead of packing bulky trouser hangers. They take up less room and work fine when slipped over a wire coat hanger.—G. A. Nicastro, Buffalo, N. Y.



SIZZLING PAVEMENTS! Drivers swelter! Cars suffer, too . . . need good care . . . like this:

Item: Battery water takes wing fast . . . check it weekly . . . keep the level 3/8" above the plates. Use distilled water for longer battery life.

"TEMP" shows hot! Oil level okay? Water level okay? Maybe the fan belt needs tightening. Perhaps outside of radiator is clogged with bugs, leaves, etc. Cooling system may be clogged with rust and require flushing. Dirty air cleaners can air-starve the engine. See "Mr. Service" at the Texaco station.

Watch tire pressure. Inflate correctly in the morning when cool. Low-pressure flexing overheats tires . . . shortens life, causes blowouts. Your Texaco Dealer will be glad to check your tires.

BEATS HEAT

BEATS



#### THERMOMETER-BEATING OIL

Heat thins ordinary motor oils. Now, thanks to Texaco research, a new Havoline Special 10W-30 oil that stays full-bodied and full-lubricating to protect your engine at sizzling temperatures, yet stays fluid to give easier starts in sub-zero weather. Use this one grade the year 'round. More than that, this remarkable oil keeps engines clean for full power-packed performance. Get it from your Texaco Dealer, the best friend your car has ever had.

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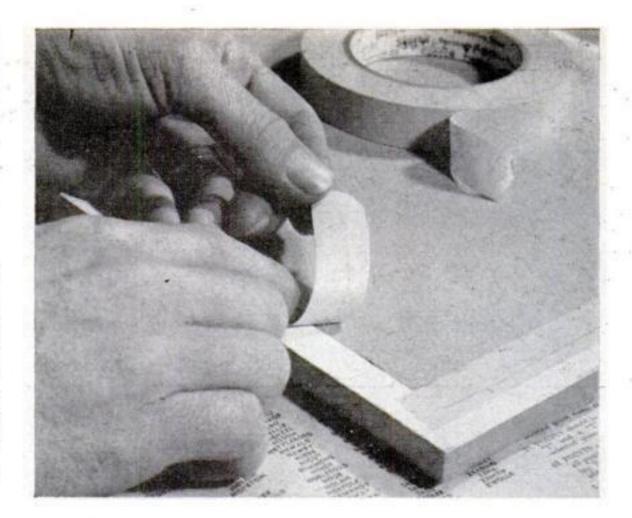
THE TEXAS COMPAN

AUGUST 1957 193

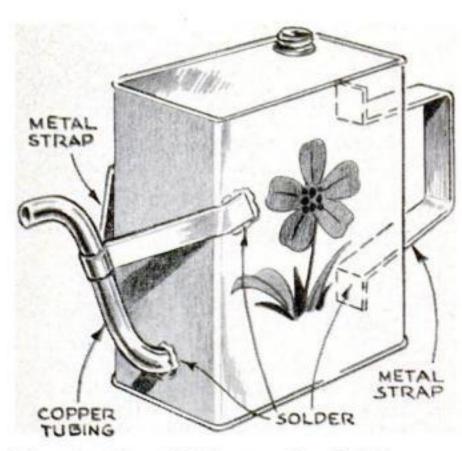
# Short Cuts and Tips

### Tape Dustproofs Framed Pictures

I SEAL the backs of framed pictures with masking tape. It is easier and faster than cementing down an overall paper sheet. And when you want to change the picture, you can peel off the tape easily without damaging the backing.—R. J. DeCristoforo, Los Altos Hills, Calif.



DIFFERENCE DESCRIPTION OF THE PROPERTY OF THE



### **Empty Can Makes a Sprinkler**

Any flat gallon can will make a watering can. Cut a low hole in one narrow side and solder on a length of copper tubing for a spout. Support the spout with a metal strap, and solder another strap at the opposite side for a handle. Enamel and decals will dress up the can.—Victor H. Lamoy, Upper Jay, N. Y.



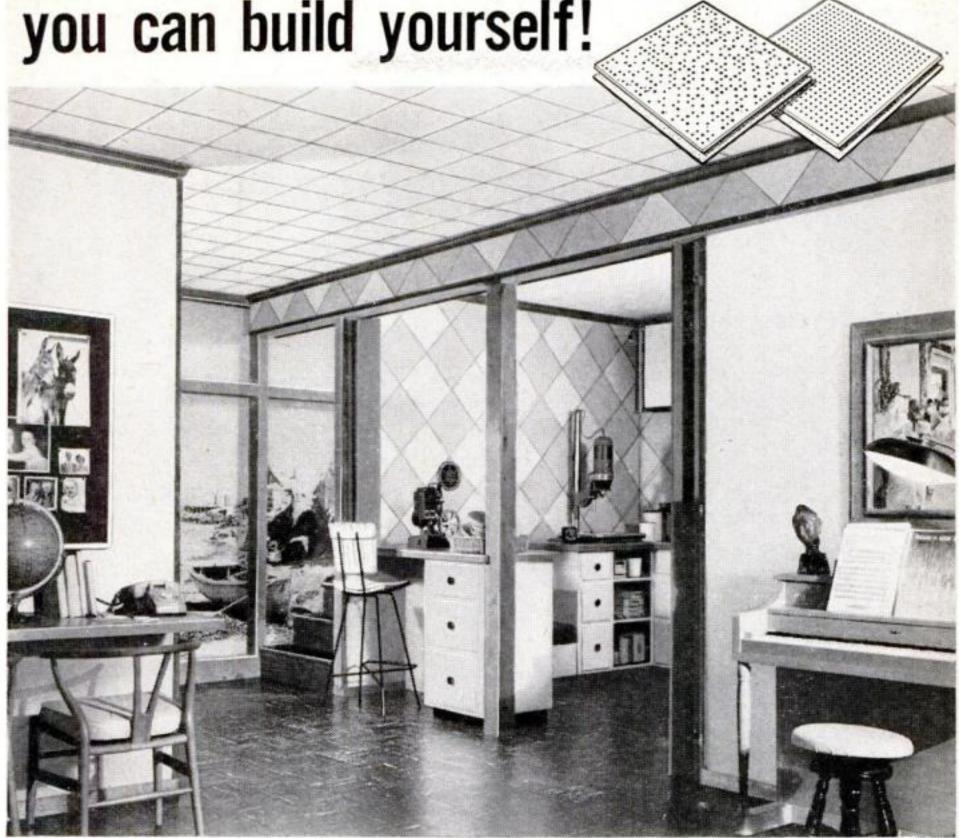
### Door Stops Give Youth a Lift

Baseboard door stops will elevate a wooden chair three to four inches to make dining comfortable for a youngster. Drill a hole in each leg to receive the threaded ends of metal stops, or screw in stops turned from wood. You can cover the holes with glides when the lifts are removed.—Norm Jacky, Fond du Lac, Wis.

▶▶▶WHEN my white ink ran out, I used liquid shoe polish for lettering on the black pages of my photo album. The white polish comes in handy, too, for writing on blueprints or on very dark greeting cards.—J. A. Stockton, Erie, Pa.

194 POPULAR SCIENCE

Here's a sound-conditioned tun room you can build yourself!



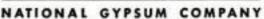
Kids should have a room where they can make all the noise they want. Parents should have a room, too — for their parties or hobbies. Even if you've never driven a nail before, you can build a soundconditioned fun room for your family. It's easy to do, and costs less than you think.

On the ceiling, use Gold Bond Acoustamatic Tiles. They make rooms pleasantly quieter, are attractive and inexpensive. Both Regular and Random patterns (see above) have hundreds of perforations that literally soak up noise. Nail or staple tiles to wood strips applied right on your old ceiling. Their rich ivory-white finish beautifies any basement.

On the walls, use Gold Bond Gypsum Wallboard and Insulation Tiles. Tiles come in ivory-white and a random assortment of four lovely pastels, have interlocking edges that hide nails or staples. Wallboard goes up fast. Saw panels like wood, or score with a knife, and snap. Finish with quickdrying Gold Bond Velvet Latex Paint. Job's done!

Want plans so you can start building? Write for free illustrated folder, "How to Remodel Your Basement," to National Gypsum Company, Dept. PS 87, Box 73, Buffalo 13, N. Y. Then see your local Gold Bond® dealer. He'll supply everything you need — including helpful advice.

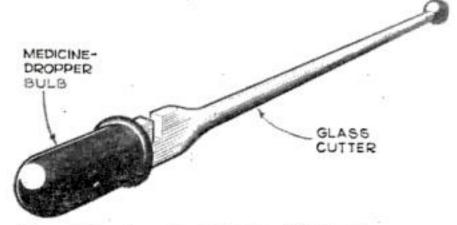






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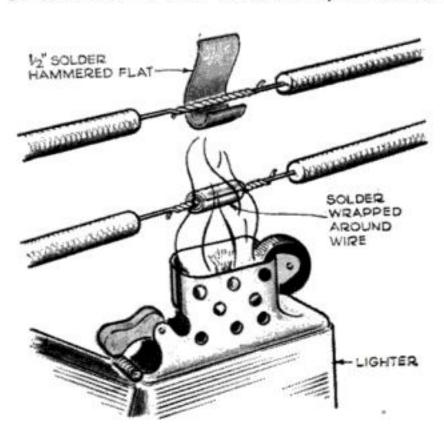
# Short Cuts and Tips



### **Cap Protects Glass Cutter**

KEEPING a glass cutter sharp insures a one-stroke, neat scratch that results in a perfect cut every time. To prevent damage to the cutter tip, slip a medicine-dropper bulb over it before you put it into your tool box.

▶▶▶There's always a small bar or horseshoe magnet in my tool pouch. As an electrician, I find it handy for removing bits of steel from junction boxes when I enlarge knockout holes to take bigger BX or conduit.—W. W. Brandhorst, St. Louis.



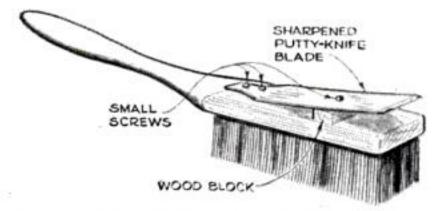
### **Lighter Solders Wire Splice**

When you have a couple of electric wires to solder together and there is no soldering iron or torch handy, use a cigarette lighter. Hammer flat a ½" length of rosin-core wire solder, wrap it around the splice, and hold it in the flame of the lighter. After the solder has hardened, wrap the splice with electrical tape.



### Tag Says No for Hound Dog

When our young basset hound stuffed himself on handouts from neighbors, we had a sick dog in our house. To make life less rough on the pup and us, I printed "Please don't feed me" on a shipping tag and wired it to his collar. Cellophane tape on both sides of the tag strengthens it and makes it easy to vipe clean.—Maurice Peacock Jr., Radnor, Pa.



### **Brush Has Piggyback Scraper**

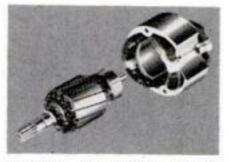
To save handling two different tools while removing loose paint before repainting, attach a scraper to the wire brush. Sharpen the blade of an old putty knife and screw it to the back of the brush. Then wedge a wood block under the blade to tip it away from the brush for easy use.—V. H. Lamont, Buffalo, N. Y.

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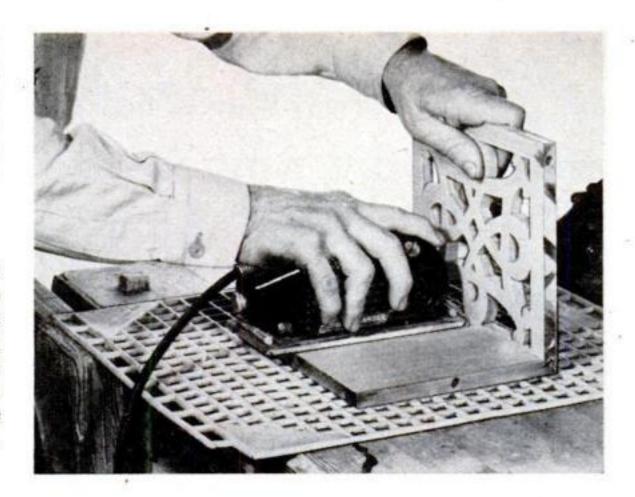
Address....

City.....State.....

# Short Cuts and Tips

#### Drainboard Mat Protects Work

Drainboard mats with grids of rubber make fine workbench pads to protect sanded surfaces. Grit and sawdust drop through the openings, leaving soft, clean ribs in contact with the finished wood.—Edwin M. Love, Palmdale, Calif.

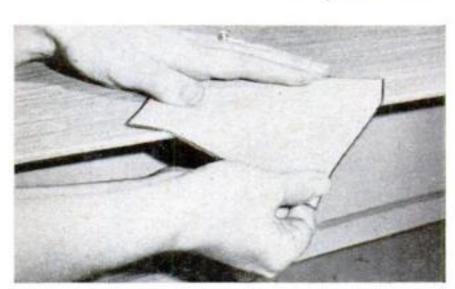


#### **Guided Shower Warms Bottle**

RUNNING hot water over the bottle when photo developer is too cool is an old stunt. But I have improved on it

to raise the temperature faster. I up-end a small glass on the mouth of the bottle. This fans out the water so that it covers all of the bottle instead of running down in narrow streams.—E. M. Hanson, Los Angeles.

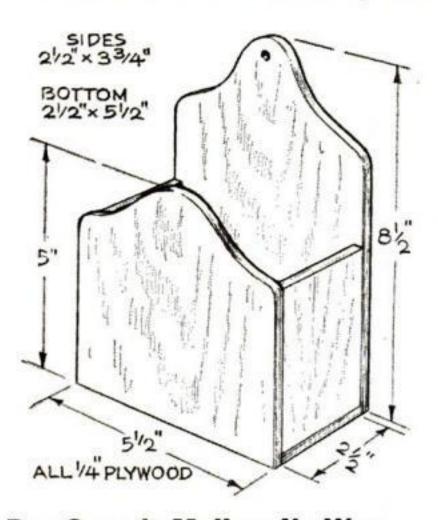




### **Tip for Folding Sandpaper**

When sandpaper is folded to reach into crevices, any jagged edges make sanding difficult. To get a sharp bend without tears at the ends of the fold, I pull the paper over a table edge a few times, abrasive side up. This makes it flexible enough so it can be folded without cracking.—F. A. Javor, Newark, N. J.

▶▶▶ Hacksawing thin sheet metal is no cinch. To make it easier, I clamp the work firmly between two scrap pieces of plywood and saw through wood and metal at the same time. I scribe a guide line on one piece of plywood to ensure an accurate cut.—Jack Stockwell, NYC.



### Box Speeds Mail on Its Way

This indoor mailbox keeps outgoing letters from being forgotten at our house. Shaped like an old-fashioned matchbox, it is made of \(^1/\_4\)" scrap plywood, and hangs at the kitchen door leading to our garage. Anyone taking off in the direction of the post office empties the box as he goes by.—C. H. Stroh, Cottage Hill, Fla.

# **AUTO-LITE POWER TIP "fires up" winners** in 1957 Mobilgas Economy Run



IMPERIAL CROWN . . . Winner in both High Price Class and Sweepstakes



CHRYSLER SARATOGA V-8...Winner in Upper-Medium Price Class



DE SOTO FIREDOME V-8 . . . 2nd Place in Upper-Medium Price Class



DODGE CORONET 500 V-8 . Winner in Low-Medium Price Class



PLYMOUTH BELVEDERE V-8. Winner in Low Price Class



Victory sweep by Chrysler-built cars proves that Auto-Lite Spark Plugs with POWER TIP deliver top performance and economy at all speeds.

The 1957 Mobilgas Economy

Run gives dramatic evidence of Power Tip's ability to give top performance and economy in all kinds of driving . . . at all speeds. For 1568 miles, in the mountains, on the highway, and in city traffic, Power Tip sparked the winners to victory. Here's how Auto-Lite Spark Plugs with Power Tip operate . . .

At low speeds, the projecting spark plug tip . . . the Power Tip . . . gets hot fast, operates hotter to burn away fouling deposits which impair engine performance in city driving. At high speeds, the Power Tip is actually cooled by the richer air-fuel

mixture to check costly and dangerous high-speed pre-ignition caused by overheated spark plugs.

Power Tip, first spark plug ignitionengineered for today's engines and today's driving, is designed for overhead-valve V-8 engines and for most overhead-valve 6's in all these cars: Buick, Cadillac, Chevrolet, DeSoto, Chrysler, Dodge, Plymouth, Ford, Hudson, Imperial, Lincoln, Pontiac, Mercury, Oldsmobile, Studebaker, Nash, Packard, Rambler.



Mobilgas Economy Run, sponsored annually by Socony-Mobil, is rigidly supervised by the Sports Commission of the United States Auto Club.



The protruding tip makes the big difference!



RESISTOR SPARK PLUG WITH

Auto-Lite makes a complete line of spark plugs, including Standard, Resistor, Small-Engine, Transport, Aircraft, and Diesel-Starting.

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# Short Cuts and Tips

# Tape Anchors Film for Gang Printing

Printing a whole roll of film on a single sheet of 8"by-10" paper can be a pesky job. The strips of negatives —especially 35-mm.—are apt to shift on the glass.

To get a neat page of contacts, I use a masking tape with adhesive on both sides. I press a narrow strip of tape along one edge of the contact-printer glass or its frame, and then stick the tip of each film strip firmly to the masking tape.—E. M. Hanly, Los Angeles.



### Pot Cleaner Filters Pump Water

A COPPER pot cleaner stuffed into a galvanized-iron pipe tee filters the water from our pump. I pushed the copper wad through the leg of the tee, then plugged it up. Bushings on the two arms adapt the tee to the pipeline, and a perforated metal disk keeps the copper sponge from being forced downstream. The filter screens out small stones and other bits of debris, and the plug is handy for periodic clean-outs.

—James R. Ranz, Wilmington, Ohio.

### Rubber Cement Plugs Holes in Camera Bellows

A VERY satisfactory patching material for a camera bellows can be made by adding a little lampblack to ordinary rubber cement. Mix the two together; then thin with benzine or a little white gasoline. Apply the mixture to pinholes, inside and out, with a toothpick or small pointed brush.—Clay Williams, Pasadena, Calif.

▶▶▶WHENEVER I have to use pliers to loosen a knurled nut, I pad the jaws with two fingertips cut from an old rubber glove. They work just as well as the copper slip-on jaws often used for this purpose.—J. A. Conrad, Allentown, Pa.





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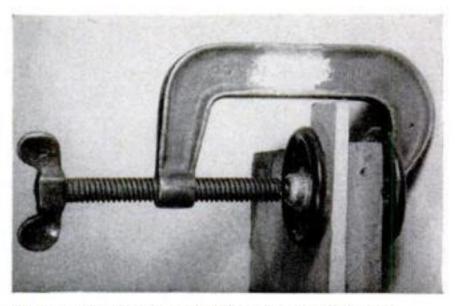
# Short Cuts and Tips

### Closet-in-Closet Adds Space

Space stolen from a fairly large linen closet provides storage for the short dresses and coats of our eight-year-old. I simply lifted out the lowest shelf and nailed a wooden rod to the supports. Our little girl not only got a closet of her own, but one that is just right for her reach.—Dr. G. W. McCoy, Bethlehem, Pa.

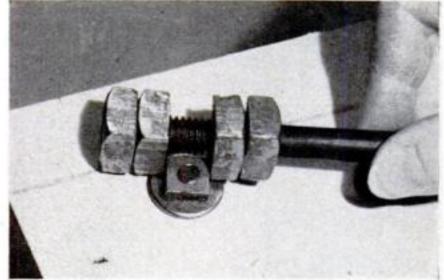
►►►EVER lose a fish because of a dull hook? You can eliminate this disappointment by carrying along a piece of emery cloth when you're fishing. The cloth is also useful for rubbing up ferrules and reels.—C. V. Mathis, Wildwood, N. J.





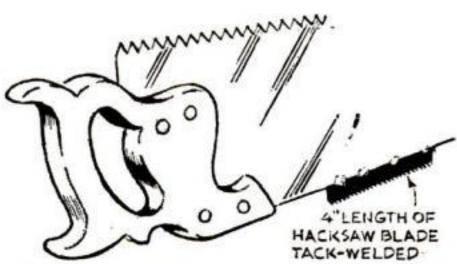
### Coasters Pad Clamped Work

I KEEP a couple of old felt-bottomed metal coasters in the shop. Slipped under the jaws of a clamp, they protect the work from blemishes. Cork coasters stacked two or three thick would do the same job.—Hugh Lineback, Stillwater, Okla.



### **Nuts on Bolt Act as Wrench**

Four nuts and a long bolt will pinchhit for an adjustable wrench when no regular one is at hand. Thread one pair of nuts onto the bolt with the heads up, then spin the two locking nuts on upside down.—F. A. James, Newark, N. J.



### 202 POPULAR SCIENCE

### **Double-Edged Saw Doubles Use**

A CARPENTER I know has a short piece of hacksaw blade tack-welded to his handsaw. On the back of the blade near the handle, it doesn't interfere with the use of the tool. He finds it handy for sawing off nails that can't be readily knocked out of salvaged lumber. And it is always right there for starting a kerf for the handsaw, too.—J. A. Crowley, NYC.

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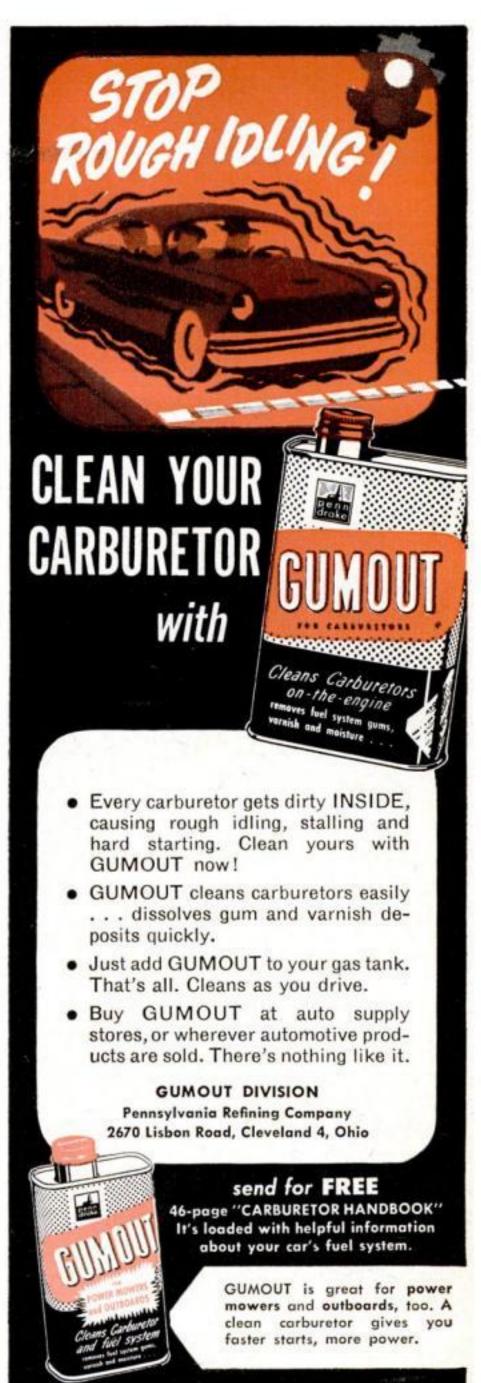
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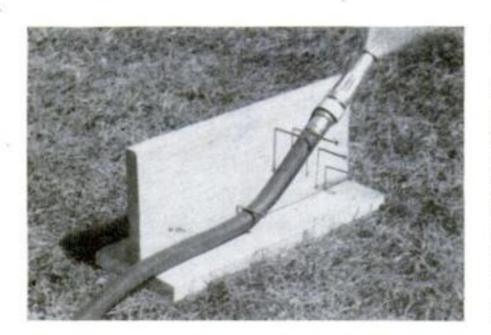


# Short Cuts and Tips

#### **Mastic Anchors Loose Stone**

Mortar is fine for laying flagstones and other masonry, but it is not strong enough for critical repairs. And preparing small batches of it is a nuisance.

For a quick but rugged job, try black mastic—the all-purpose cement made from reclaimed rubber. I used it to reset a flagstone that jutted out over a pool. After four years, the stone hasn't budged. —Darrell Huff, Sonoma, Calif.



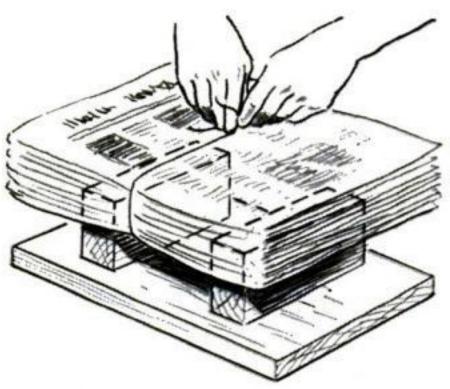
### Frames Hinged with Tape

You can make twin picture frames for portraits from a pair of matching frames. Lay the framed pictures face to face and run a strip of plastic tape along the edges to be joined. Then stick short tabs of tape across the joint to strengthen the hinge.—W. H. McClay, Pasadena, Calif.



### Hose Holder Angles the Spray

Two 12" pieces of one-by-six board form this adjustable holder for your garden hose. Fasten the boards together in an inverted T. Drive one eight-penny nail into the upright board near its lower edge to hold the hose against the base. Four other nails go up forward, fanned out so that the nozzle can be wedged between any two to raise or lower its aim. Paint the holder for durability and appearance.—Gene Nelson, Minneapolis.



### Paper Rack Makes Baling Easy

Tying up newspapers is less of a chore if you store them on a rack that looks like an inverted stool. A large accumulation of papers won't buckle on the woodblock supports and you can pass twine around the stack without having to shift it.—W. C. Irving, Silver Spring, Md.



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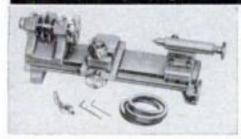
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In addition to power and pick-up loss and carbon fouling the engine's "insides," driving with excessively worn bearings can cause costly crank-shaft damage—perhaps even replacement! When engine sluggishness and increased gas and oil bills signal worn bearings, to protect the shaft and to restore power, pep and economy, replace with Federal-Mogul main and con rod bearings—they are engineered for the job! Ask your mechanic!

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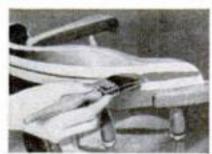
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206 POPULAR SCIENCE

### You CAN Afford Those College Bills

[Continued from page 97]

• He should need the money. Many schools won't consider a youngster for a scholarship, no matter how brilliant he is, if his father makes more than \$8,500. When your child applies for a scholarship, you'll probably get a long form asking about your income, assets, dependents and so on. It will come from the College Scholarship Service, which helps the colleges appraise the "need" of applicants.

But many scholarships require out-ofthe-ordinary qualifications. If your child happens to fill them, he may get the money even though his grades are not tops or his need is not acute. Wealthy people often endow scholarships, specifying that the winner must be from the donor's home town (say Bucyrus, Ohio); must have the same last name (at Amherst the lucky names are Anderson, Clapp, Rowland and Borden); or must have a parent who is a teacher, minister, widow, and so on.

Children of GIs who died from war injuries can get up to \$110 a month for college from the Federal Government.

Loans. This source of money is the one most people overlook. The average college has at least twice as much money to lend out as is applied for; some schools have eight times as much. The schools prefer to lend money to upperclassmen (because a great many freshmen drop out) but others make loans to freshmen.

More and more, you'll find colleges eager to interest you in a loan. As an official at Yale says: "Everyone else in America is selling on credit!" Lending spreads the available money further than outright gifts.

How much will the colleges lend? Often, the entire tuition.

At Massachusetts Institute of Technology almost any student in good standing can borrow more than \$1,000 a year during his last three years. And the terms are amazingly inviting. There is no interest to pay until after graduation. Then the interest becomes one percent and the debt can be paid off as leisurely as you choose, as long as the principal is reduced by \$100 a year.

Some other colleges charge two percent interest during college years, four percent after graduation.

You can also get, at hundreds of col-

#### You CAN Afford Those College Bills

leges, short-term easy-payment plans for spreading the big tuition charge over the year. At Washington University in St. Louis, for example, it's six payments.

Another system is The Tuition Plan, Inc. (347 Fifth Ave., New York City), which will take over paying school costs and bill you each month. You pay the Plan. It charges four percent for the service.

Your money. Dad is still the mainstay when it comes to financing college. On the average, he supplies \$640 a year. That means about \$12 a week.

Colleges are pretty expert at estimating how much a student can expect from home. Harvard, for example, assumes you should "maintain" your youngster (food, clothing, shelter, health), whether he is

NEXT MONTH: Many firms now hire young people just to send them to school. Is this how your youngster can get an advanced education—free? See the September issue of Popular Science for a full report on how to learn while working.

at college or not. How much does that come to? Harvard figures it depends on how much you earn and how many kids you have—and has worked out a table. If you make \$5,000 a year and have two children, this table says you ought to kick in \$550 a year toward college.

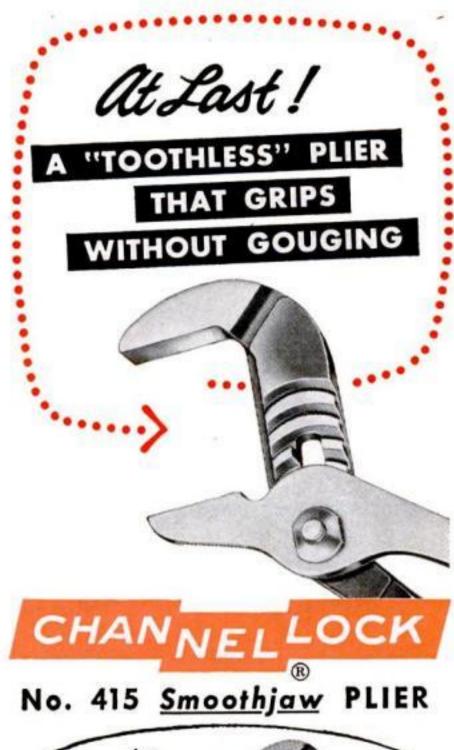
If you have a few years before college, make sure you'll have the cash when the time arrives by starting a "college fund." Buy U. S. bonds, put money in a savings bank, or invest in conservative stocks. If your child is very young, consider an endowment policy on yourself or him. Some insurance companies have policies to pay for college.

How it adds up. Now let's see where we stand in raising the \$1,600 that the average collegian needs. We'll assume no scholarship is obtainable, and be conservative all along the line.

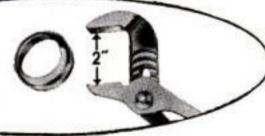
Work during school months\$	450
Summer work	400
College loan fund	200
Dad	550

\$1,600

How to beat the averages. Maybe you can't raise \$1,600 in that way for four



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208 POPULAR SCIENCE

### You CAN Afford Those College Bills

separate years. College is still a possibility if you know how to cut corners. Here are five tips:

- 1. Choose a low-cost college. At some schools the total cost is half the \$1,600 average. Check on state universities in your own state (outside your state, you may be socked for extra assessments). There are several dozen colleges that charge home-state students no tuition whatever (and only modest fees). Among them: Alabama Polytechnic Institute, University of Arizona, University of Alabama, Berea College, City College of New York, Florida State University, University of Idaho, Louisiana State University, University of Missouri.
- 2. Let the Army, Navy or Air Force send your son to college. At the service academies (West Point, Annapolis and Colorado Springs) the Federal Government picks up the whole tab and even tosses in spending money (\$111.15 a month at West Point).

To qualify for entrance examinations, your son has to be nominated. Contact your U. S. Representative or Senator, or write to the chief of personnel for the department (Army, Navy or Air Force) that most interests your son. The address is The Pentagon, Washington 25, D. C.

Pick a nearby college so your youngster can commute from home. On paper, at least, that saves up to \$700.

Nearly all cities have either a large college or a "feeder" branch of a large college where your child can go the first two years, then transfer to the main campus. Pennsylvania State University, the University of California and the University of Michigan, to mention just three, have networks of branch campuses in their states.

- 4. Night school. College at night, work in the day is a fast-growing trend. More than 100 colleges now have full-scale programs. Half the students are seeking degrees, although this usually takes eight years. Your high school's guidance counselor can tell you about local possibilities.
- 5. Two-year college. Many youngsters—and perhaps yours is one—could profit from advanced training beyond high school but don't really need a full four-year course. These two-year schools are known also as community colleges, junior colleges or branch "centers."

# How We Dropped the A-Bomb [Continued from page 75]

it, I've got to make two more quick changes in the wiring."
4:59 a.m.

Heading, 340 degrees. Indicated air speed, 217 m.p.h. The sun climbed into the sky on our right.

It was the last dawn for Hiroshima. We started our climb for the rendezvous at Iwo. We would slip into our lonely three-plane formation at 9,000 feet.

5:55 a.m.

Three minutes behind schedule we picked up the Great Artiste and No. '91. They joined up slowly and carefully and we thundered off toward the northwest, leaving Iwo snugly asleep.

Low stratus clouds began to thicken underneath us, and before long we were on top of a solid undercast.

#### 7:40 a.m.

Capt. Parsons crammed his lanky frame down behind the A-bomb once again. In minutes, he had completed arming it. Now the bomb was "live." It could be dropped at any time.

Capt. Parsons put away his sheet of instructions.

We poured the coal to her for the last climb. We would strike from an altitude of 31,000 feet.

#### 8:30 a.m.

We had maintained complete radio silence since we broke off from Ed Dahl. Now a coded message came in to us from Capt. Claude Eatherly in one of three weather planes. "Ten miles visibility, 2/10 cloud cover at 15,000 feet over Hiroshima."

Because the weather was clear, Hiroshima was chosen. One of the alternate targets was Nagasaki.

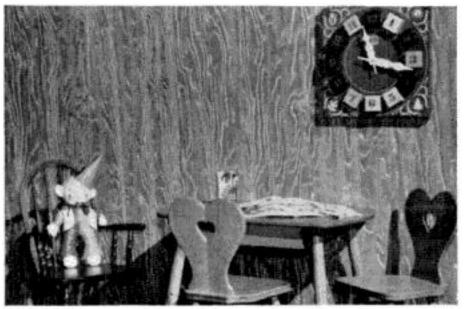
Hiroshima, population 344,000, headquarters of the Second Japanese Army, site of the largest quartermaster depot in the world, and a large and important port of embarkation, had 45 minutes to live. 9:00 a.m.

We had made our landfall, the tip of Shikoku Island, and now we swung east in a feint. We turned the radar off. From then on, we flew manually, taking the headings that Ferebee fed us as we neared our target.

Parsons, his high forehead sweating a little now, picked up his instruction sheet and squeezed down into the bomb bay

# How to get beautiful finishes for your wood or plywood projects

Painted, stained, or "natural," a good wood finish depends on how uniformly the hard and soft portions have been sealed. Firzite® controls "wild grain," prepares the surface for any type of finish.



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How We Dropped the A-Bomb

for a last anxious look as his handiwork. 9:12 a.m.

We were at our IP, initial point, and heading almost due west. Maj. Ferebee took over for the three-minute bomb run.

Radioman Richard F. Nelson, PFC, sent out one long beep to advise Capt. Sweeney and Maj. Marquardt in the other two planes that we had only two minutes to go.

With 20 seconds to go, he would send out a steady tone that would be cut off only when the bomb was released. 9:15 a.m.

Bomb away!

Tibbets yanked off the autopilot, hauled the plane over into a 60-degree bank, and nosed her down to pick up speed.

We had 43 seconds to get away before hell broke loose over the city of Hiroshima.

Everyone else in the crew had put on his welder's glasses, but now, in this crucial moment, we found that we could not fly the plane with them on. We threw them aside and rolled out on a heading of 60 degrees . . . and the cockpit filled with a sickening purple light.

Almost immediately, the Enola Gay, now 12 slant-miles from the burst, bucked and dropped earthward, caught in the shock wave. A few seconds later, the echo of the shock wave slapped her side and tossed her up again, only to let her drop.

Within three minutes, the mushroom cloud that was to become the symbol of the atomic age had climbed to our altitude, 30,000 feet.

Below us, 78,150 men, women and children lay dead or dying. 13,983 would be reported missing. And 37,425 more were wounded.

The code word went out for "Mission Accomplished," and we headed southeast, sober at first, then chattering like a bunch of school kids.

Hopefully, we listened in to the radio for word that Japan had surrendered, but it did not come. Only after the same chaos had been unleashed on Nagasaki three days later would the fanatical Japanese war lords capitulate.

At 1500 hours that afternoon—5 hours and 45 minutes into the age of atomic warfare-we touched down at Tinian. It had been a long flight. END

#### How to Choose a Portable Radio

[Continued from page 88]

tube portables with push-pull outputs.)

Big power or small? Push-pull output can also deliver more power than a singleended stage. It isn't needed in tube sets. but transistors don't have nearly as much muscle, so the small, single-ended transistor jobs may be on the weak side.

If you don't want to wake the baby when you listen to a radio at home, you usually keep output power (volume) below a quarter of a watt—or 250 milliwatts. Out-of-doors, except where surroundings are noisy, that much volume is adequate at a distance of 10 or 15 feet. In quieter places, or at closer range, 50 milliwatts can seem pretty loud.

The figures for maximum output given in the table should help you distinguish between a set that's good chiefly for private listening and one that can ride out a fair amount of noise. In general, the less powerful sets use smaller speakers, which cuts down on sound quality as well as volume. Some portables, it should be noted, distort to an unlistenable degree at high volume. Don't interpret the maximum output of a set as an index of general quality.

Sensitivity. If you take trips to the edge of nowhere, check the sensitivity of the portable you plan to buy. Figures for sensitivity—the most technical item listed in the charts—are given at both ends of the broadcast band. Sensitivity of a receiver is a measure of the weakest input signal (in microvolts) from which the receiver can produce a given amount of sound output. PS asked manufacturers to specify sensitivity for 50 milliwatts of output power. Lower numbers indicate greater signal-pulling ability.

More I.F. (intermediate-frequency) or R.F. (radio-frequency) amplifier stages will increase sensitivity. In the PS charts, transistor sets vary, in this respect, only in the number of I.F.'s, tube sets in the addition of an R.F.

The more powerful portables can substitute for car radios. But don't expect one to do as good a job as an installed radio. You need more power than many portables can deliver comfortably, to hear above wind and road noise. And, since the metal car body is an effective shield against radio waves, you may have to perch your portable close to a glass area



GENERAL ELECTRIC



Output—1000-1500 Lbs, per Sq. In. 
For filling aqua-lung tanks For air brush work Filling accumulator and air-oil shock struts Cleaning and testing spark plugs Hundreds of other uses.

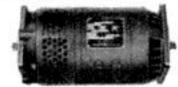
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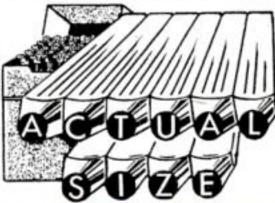
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#### How to Choose a Portable Radio

in order to pick up enough signal on weak stations.

Batteries. From manufacturers' estimates of battery drain and life expectancy, PS calculated minimum cost for each hundred hours of operation. The figures range from under a dime to over \$12, so the amount of battery-powered listening you plan to do is a big factor in your final choice.

Small differences on charted figures are not necessarily significant. It is also possible that many of the low cost figures reflect ideal rather than average conditions.

Transistor sets employing push-pull output stages, for example, can't be expected to show up as well in actual use as they do in the chart. The hundred-hour cost figure is based on estimated service life at 10 milliwatts' output, but much of the time you'll have the set turned up louder, using more current. A big factor, too, is the variation in individual batteries, even of the same brand. Some new batteries give much longer life than others.

Another factor that may increase battery cost: Conditions of normal set use are frequently tougher than those in a laboratory. Life tests on batteries are generally run at 70 degrees; but portables are used at the beach or in the bleachers. Different prices are given in the charts for a few batteries that seem to answer the same description. Some units—especially in flashlight-cell sizes—are available in either standard or heavy-duty carbon-zinc types, or in the newer alkaline or mercury versions. They are physically and electrically interchangeable, but vary in cost and service life.

Which type is best? According to the estimates of several manufacturers, mercury cells outlast their carbon-zinc equivalents by four to five times. But they cost about six times as much, so they don't show up too well in the hundred-hour column.

The advantages of mercury or alkaline cells are that they hold a charge better during long periods when they're not used, and are less likely to quit at an awkward time.

One battery complement that—theoretically, at least—has all others beat for long life and low cost is the four recharge-

#### How to Choose a Portable Radio

able "AA"-size cells used in the Hoffman Model P411. (This is the radio the man is holding in the photograph on the magazine cover.) The recharging unit built into the handle of this set takes its energy from sunlight, so battery cost should work out mighty close to zero, if you live long enough.

There is a difference of opinion among designers on the merits of the single-unit battery vs. standard flashlight cells. The latter are inexpensive and easily available but they waste space and don't last as long. The special single-unit battery, composed of many cells in one casing, costs about 50 percent more and you won't find it in every drug store. But it needs less space in the set and, according to one manufacturer's tests, gives about twice the life of comparable flashlight cells.

Shopping tips. Some features can't be boiled down to figures in a chart and have to be weighed at time of purchase. After you've narrowed your choice by studying the specs, try out the two or three likeliest models.

Work the tuning knob. Is it in the right place for convenient use? Is it large enough to handle? Are the markings clear? Is it so touchy that accurate tuning takes an effort?

Flick the switch. Is it clearly marked so that you'll know whether it's on or off? Is the action firm and positive? Is it placed where it won't be turned by accident?

Tune the set over the whole band. Do all—or most—local stations come in strong and clear? Do stronger stations blast badly, or is volume fairly uniform from station to station?

Listen carefully for sound power and quality, especially on a little set. Does it pack a good wallop? When you turn the volume control all the way up, does the sound remain clear? (If it distorts, make sure that the maximum clean sound delivered is well above your normal listening level.)

Most portables work well on fresh batteries. While an ample reserve of power isn't a sure sign that a set will remain sharp after the batteries start running down, the reverse is usually true. A portable that is marginal with new batteries won't improve as they age.

Superior's New Streamlined Model TD-55

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The Model T D-55 incorporates a newly designed element selector switch system which reduces the possibility of obsolescence to an

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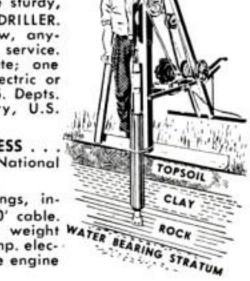
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214 POPULAR SCIENCE

# New U. S. Missiles Attack Heat Barrier [Continued from page 93]

To take the heat themselves, planes and missiles will demand high-temperature materials throughout. Fused-quartz windshields good to 1,700 degrees will replace glass and transparent plastic, which would soften or melt. Accessory makers stand ready with electric motors that purr contentedly within metal housings hot enough to light your cigarette; and with ceramic radio tubes that work beautifully while resting on hot coals.

But it's wings, fins and fuselage especially their leading edges—that take the brunt of the thermal thicket's heat, and will call for the most radical innovations. Here's the picture as the metallurgists currently see it:

With the boiling-hot Mach 2 Starfighter, conventional aluminum aircraft alloys have just about reached their speed limit. Above 300 degrees F., they weaken and creep disastrously.

Magnesium alloys stand heat better. One new one, containing mildly radio-active thorium metal, looks good up to 700 degrees. It will form the skin of the Vanguard satellite-launching rocket vehicles, except for propellant tanks and nose cone. Monel metal, a nickel-copper alloy used for the body of the X-2, has similar heat resistance.

Stainless steel, of which the X-2's wings were made, can withstand up to 1,000 degrees. To overcome the disadvantage of its weight, stainless-steel "honeycomb" will be sandwiched between thin sheets for the wings of the Martin XB-68—a projected tactical bomber that's expected to match the X-2's bullet speed.

Alloys of titanium, the strong and light new wonder metal, rival stainless steel. Plastics able to resist heat up to 1,000 degrees are an even more recent development. The nose cone of the Vanguard satellite vehicle, it's now revealed, will be molded of asbestos-reinforced plastic and will have a titanium-metal tip.

"Super-alloys," some consisting largely of nickel or cobalt, stay strong at a red-hot 1,400 degrees or more. Under such names as Inconel 700, Hastelloy C, and Waspalloy, they now serve in hot spots of jet engines, and may form the "heat armor" of coming aircraft.

Champion of high-temperature "missile metals" is molybdenum. The silvery

New U. S. Missiles Attack Heat Barrier metal can take 2,000 degrees without flinching, and the best of newly announced molybdenum alloys can resist near-white heat of 2,400 degrees. New techniques apply protective coatings that prevent oxidation, and put molybdenum at the service of spaceship designers.

Ranking right up with the most heatresistant of metals are radical new structural materials called Pyrocerams. Currently the nose cones for some military missiles are being fashioned of these nonmetallic and lightweight substances, which Corning Glass Works creates by turning special glass into ceramic-like, crystalline products. (It's done by seeding the glass with "nucleating agents" around which the crystals grow, when an oven applies heat.) Corning says it has a Pyroceram that can get as hot as 2,460 degrees before softening.

Then what, to survive temperatures up to the sunlike heat that the ICBM will encounter? If researchers know, they aren't telling, but speculation hasn't been lacking. Guesses range from graphite and hafnium carbide—a blue-black crystalline substance whose 7,500-degree melting point is the highest known—to gold, platinum, even diamonds. Nothing is too "exotic" for consideration, the engineers say, in this new realm of incredible speed and heat.

Even if the heat limitations of all known materials fall short of temperatures to be met, various artifices may close the gap:

Mirrorlike surfaces of polished metal would evade some of the heat by reflecting it away. Conceivably an ICBM nose cone might be adorned with a gleaming coat of precious gold or platinum, which take a high polish, besides ranking high in resistance to tarnish and corrosion.

A blunted tip, strikingly contrasting with the needle noses of conventional supersonic craft, would ease the heat problem for a hypersonic nose cone. It would hold at "arm's length" the missile's ultra-hot shock wave, detaching it from the nose cone and pushing it a little ahead of the missile. Recent research vields the surprising discovery that this advantage more than offsets the sacrifice of other aerodynamic qualities. Considered a major breakthrough in ICBM development, the new blunt-tip concept is

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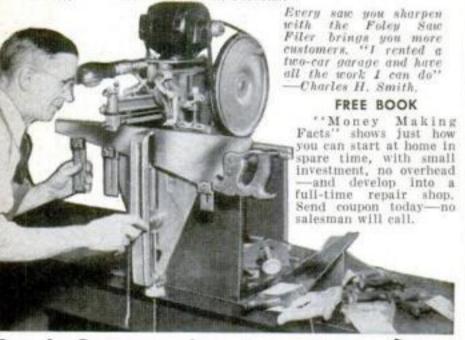


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New U. S. Missiles Attack Heat Barrier

believed so promising that it may even hold down the temperature of the ICBM nose cone to 2,000 degrees—well within the range of materials now available. It also may be applied in 1,500-mile "intermediate-range" missiles now under development.

"Sweat" or transpiration cooling may fight the heat, too. Through walls of porous metals, now available, planes and missiles would exude a volatile liquid that would cool the craft's skin by its evaporation.

Last resort could be to say, in effect, "Let it melt"—or sublime, in the case of materials like graphite, which turn directly from solid to vapor. If the fierce heat of re-entry will burn away a nose cone's refractory material, simply use a layer so thick that enough will still be left. The idea might work if exposure to heat is brief—they talk of 20 seconds for a re-entering ICBM—and damage is acceptable, as it would be for a "one-shot" missile. And it might even be considered for manned, expendable warplanes.

Picture an interceptor plane with molybdenum wings, swathed in asbestos or spun-glass insulation, and then encased in a wing-shaped layer of refractory ceramic. Rocketing at hypersonic velocity, with leading edges glowing white-hot, it overtakes and destroys an enemy nuclear bomber. Then, with its wings' knife edges burned away, and barely able to fly, it limps back to base. The pilot will fly again, but the plane has given its all, in one brief burst of speed, to save a city.

By which of these approaches, if any, the ICBM's designers are proceeding, can only be conjecture. But a fascinating hint of extraordinary progress toward licking the heat barrier was recently given by H. C. Sullivan of the Materials Laboratory at Wright Air Development Center.

Atomic bombs with their temperature of millions of degrees have been serving as a "testing facility" for high-temperature materials, he told the Institute of Aeronautical Sciences. And, contrary to expectations, "Air Force engineers have demonstrated that metallic specimens can survive the rigorous conditions existing in the atomic fireball." Scheduled during this year's atomic trials in Nevada, in his own guarded words, were "more sophisticated tests."

### What Makes Cars Cost So Much?

[Continued from page 70]

gers can get their cars from only one source
—new-car agencies that sell at a discount
in the dark of the moon to get ready cash.

To document their opposition to the car supermarket, manufacturers are trending in an opposite direction. They are splitting up dual dealerships — the Lincoln-Mercury, Plymouth-De Soto and Chevrolet-Oldsmobile—into single-brand dealerships. What this will mean to bootlegging and prices remains to be seen.

# The high cost of high style

An important but little-publicized factor in car costs is something economists call "accelerated cycling."

Cycling simply means model changes.

The industry cites grim tales of what happens when a manufacturer fails to cycle—doesn't keep up with the Joneses. Chrysler was in trouble around 1954 because its cars didn't have the style of its competitors. Today, with radical styling changes, the corporation's sales are booming. Lincoln tried to stretch a body-change cycle from 1952 through 1955, and lost a third of its sales.

Years ago a manufacturer could, by moving a little chrome around or changing a radiator grille, make his car look different year after year. The tools he used in boring cylinder blocks and the dies used in forming sheet metal could be amortized over a considerable period of time.

Beginning with the 1949 models, car manufacturers got into a three-year cycle. Tools still lasted, but body dies were thrown away every third year. Starting with 1955, the cycle was reduced to two years for some makes. Somebody has to pay for the fabulous expense of this, and inevitably it's you, the car buyer.

If a manufacturer spends \$50,000,000 (a modest amount) on new dies, engineering and plant arrangement, and he sells a million cars a year for each of the two years of his cycle, every car he produces must bear an additional \$25 wholesale charge to write off the expenditure.

As an actual bookkeeping procedure, he generally writes off about 60 percent of it the first year and 40 the second.

In the 1958 model year, cycling will be a prominent reason for a fresh boost







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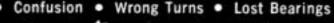
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# 218 POPULAR SCIENCE

### What Makes Cars Cost So Much?

in prices. The changes were to be relatively modest. Only Chevrolet, Pontiac and Lincoln-and, to a lesser extent, American Motors cars—were due to cycle. Ford, Mercury, Cadillac, Oldsmobile, Buick, Studebaker, Packard and the entire Chrysler line had cycled in the 1957 model year.

But then something happened. The 1957 Buick and Oldsmobile, despite new dress, were received by the public as merely warmed-over '56 models-they didn't look "different" enough. Chevrolet sales were off, to the advantage of Plymouth and Ford. General Motors took a worried look at all this and decided to open up the strongboxes where its 1958 plans were stored. A "crash" program of changes ensued, including substantial ones for Buick and Olds. Last-minute changes cost premium money.

It now looks as though expenditures by all car manufacturers for tooling, styling, engineering and plant changes will total some \$975,000,000 for the new model year. This whopper has been exceeded only by the \$1,000,000,000-plus spent for the 1955 models. Without spending a cent more in the next two years, the industry, in order to write off this cost, will have to add \$75 to the wholesale price of each car if it enjoys two big 6,500,000-car years.

All manufacturers aren't happy about accelerated styling. One remarked ruefully, "Sure, I'd like to see all of us enjoy a longer time to pay off tools and dies. But who's going to be brave enough to take the lead?"

His question is academic. Frequent, flamboyant restyling may be extremely costly; and U. S. cars may be, as critic Lewis Mumford says, "fantastic and insolent chariots." But when millions of customers wave checks at him, no large manufacturer is likely to turn his back.

What's going to happen? Out of the cloud of arguments about car prices, certain conclusions emerge:

- Car prices have risen a little more than has the cost of living, and the rise will probably continue this fall;
- The reasons, numerous and complex, reveal no clear-cut villain; but
- One fundamental explanation lies in the public's willingness to pay for what it wants. What it wants, today, seems to be performance, gadgetry, and styling.



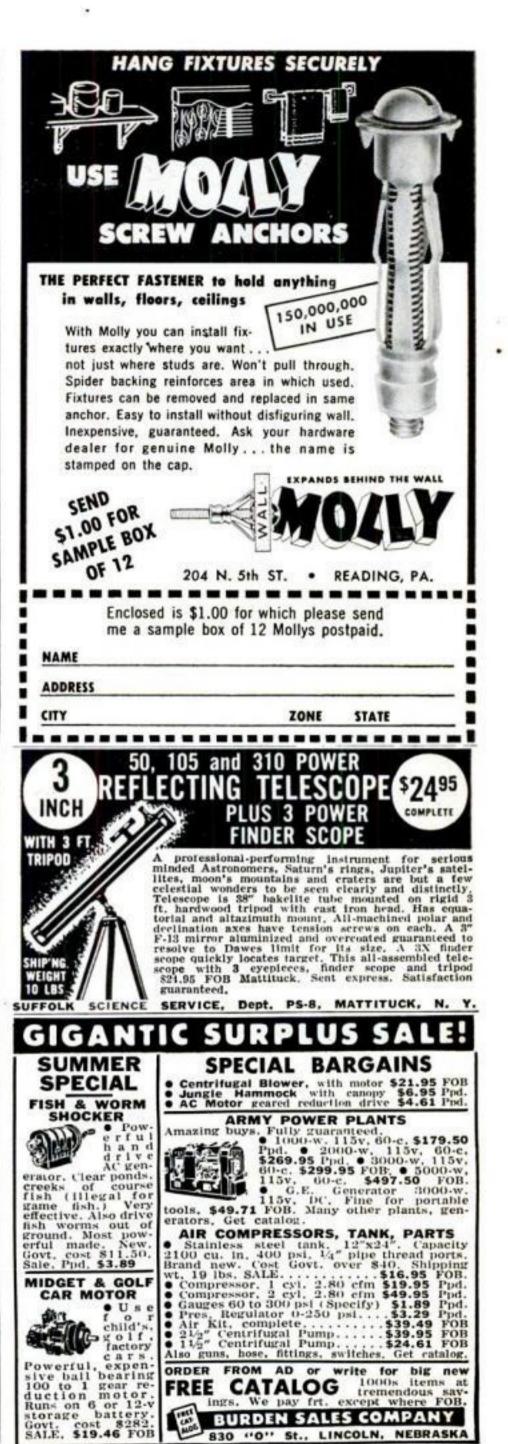
# **Copters Get a Mountain Perch**

When storms tear down power lines in the Canadian wilderness, platforms like this one on the side of a mountain let whirlybirds land the work crews and fly in any supplies that are needed.

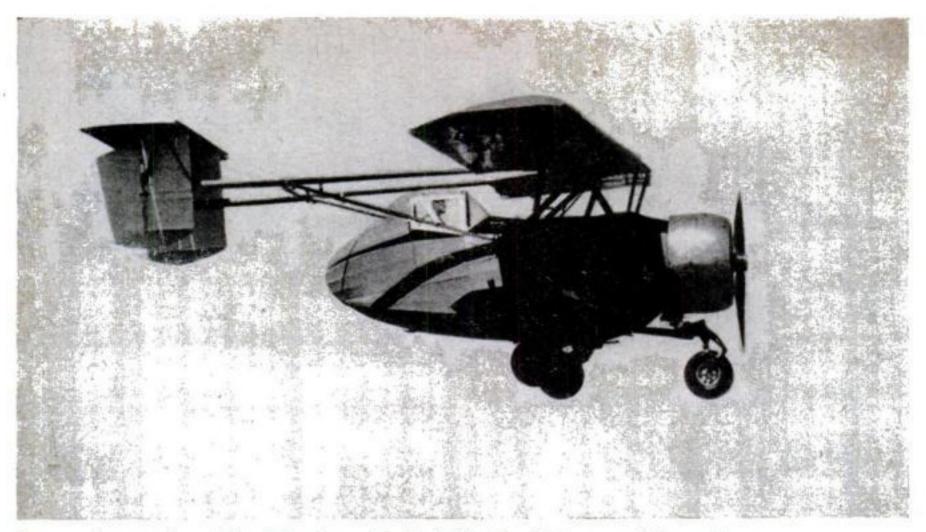


# **Fancy Tower Puffs Smoke**

This modernistic tower hides the smokestack of a Belgian atomic-power plant. Catwalk (right) leads to a circular stairway winding to a smoke filter at the top.



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# Crop-Spraying Sky Tanker Puts Pilot at Rear of Fuselage

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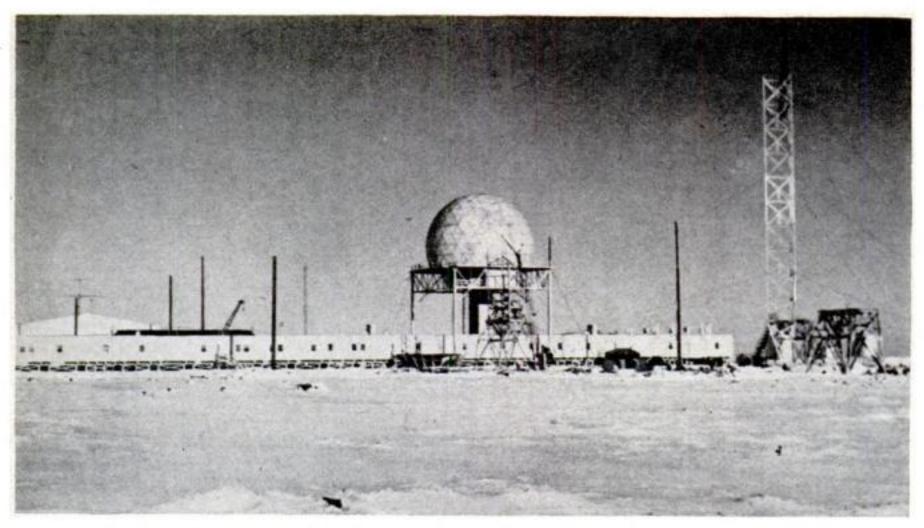
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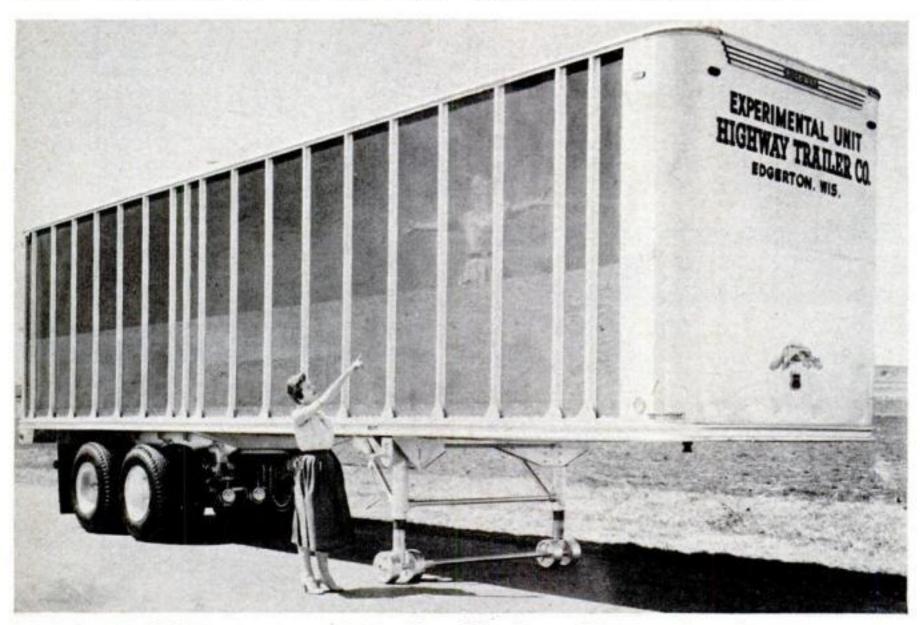
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equipment. The installation is one link in a 3,000-mile-long electronic "fence" that can give the U. S. and Canada warning of attack from over the pole.



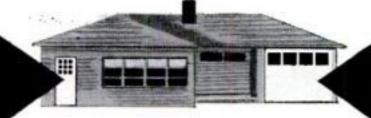
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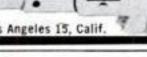
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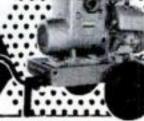
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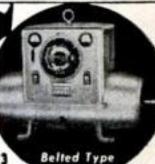


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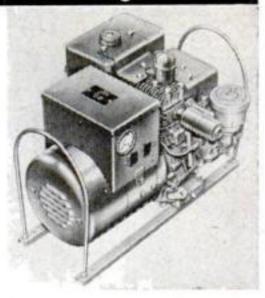
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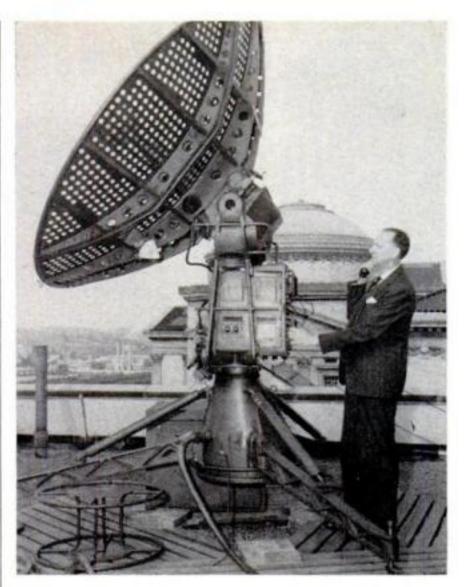
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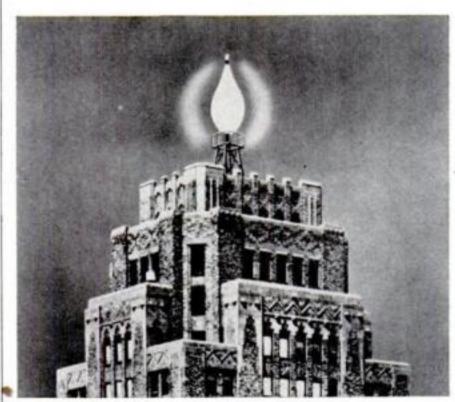


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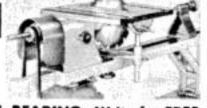
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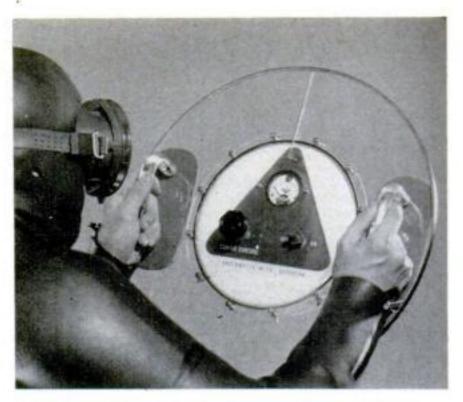
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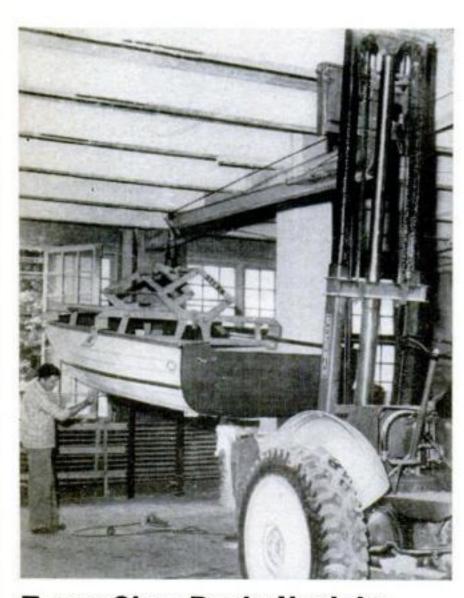
# Students Build \$65,000 Brain

A TWO-YEAR project of student engineers at the University of Michigan, this electronic computer can add, multiply or divide 10-digit numbers in millionths of a second. But it will be apart most of the time as classes study its design, add new units or rearrange old ones.



# **Diving Eye Hunts Underwater**

A SKIN diver can take this waterproofed electronic helper down 100 feet in his quest for sunken treasure—or maybe a lost outboard motor. The Goldak Co., Glendale, Calif., says it will point out metal objects through a 10-foot wall of water, mud or even rock.



# **Tongs Stow Boats Upstairs**

BUILDING boats one flight up poses no problem for this factory. A pair of tractor-mounted tongs grips rough hulls and lifts them to the second-floor shop. Another lowers and loads finished craft on trucks below. Heppenstall Co., New Brighton, Pa., designed the tongs.



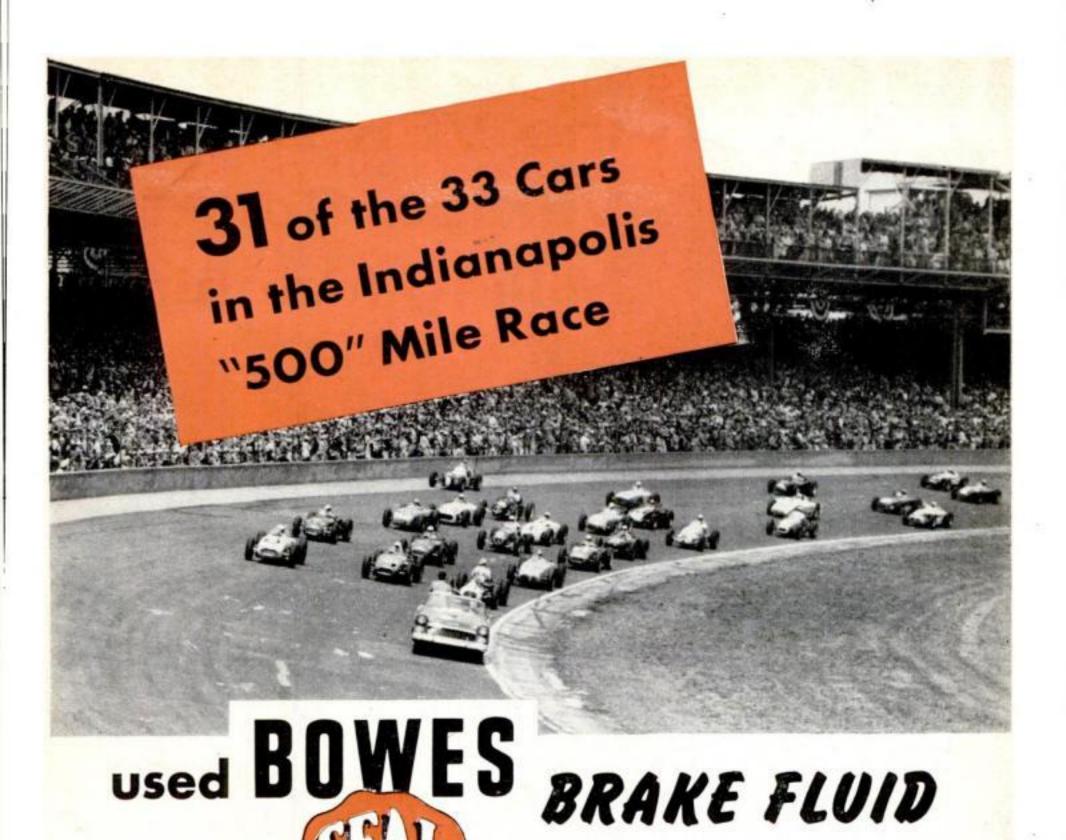
# Albatross Tries Out New Wings

A faster version of the Grumman Albatross, the SA-16B, shows off above flying on one engine with its port prop feathered. The reworked air-sea-rescue amphibian has a 16½-foot longer wing and larger tail to increase range and cruising speed, and reduce stalling speed.

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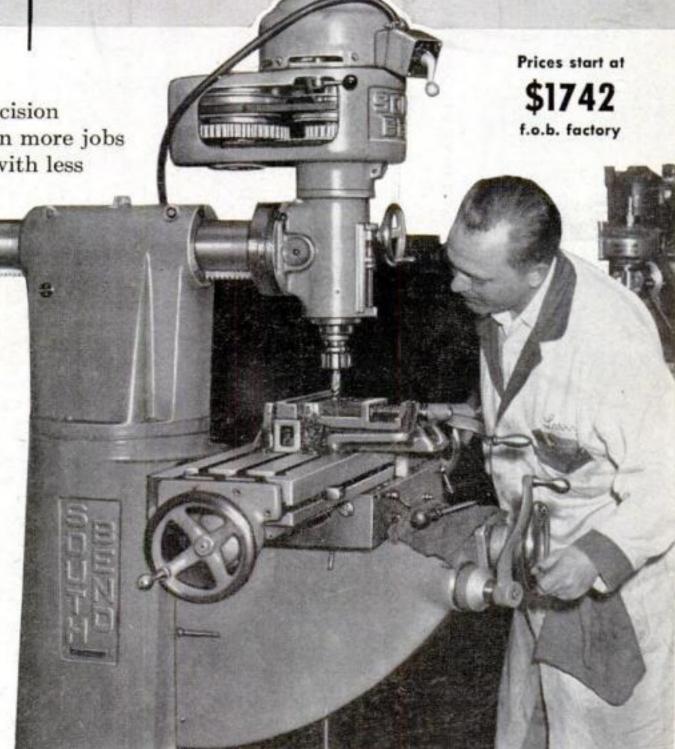
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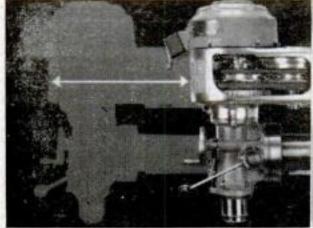
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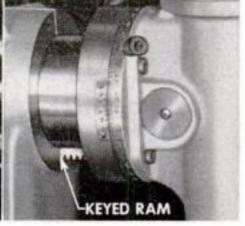
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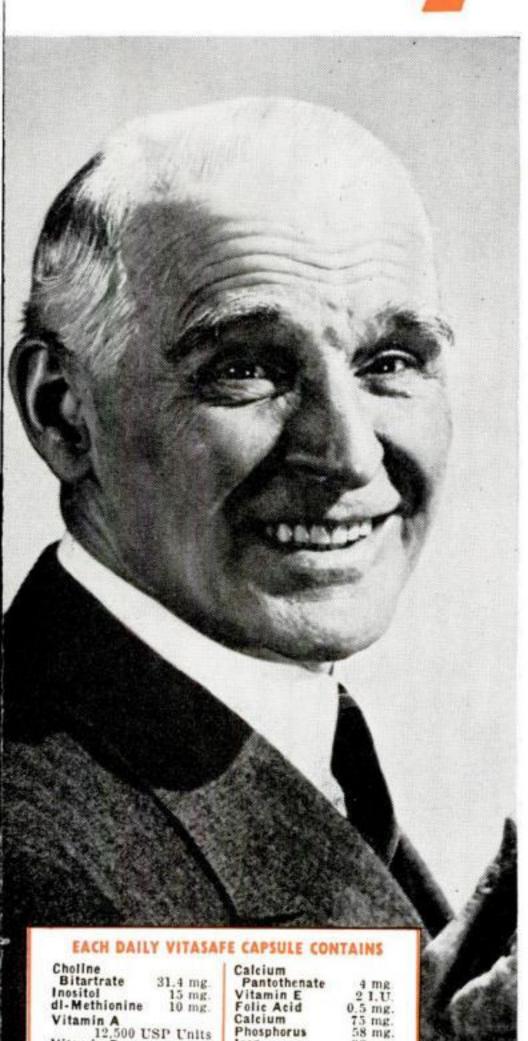


This mill saves you the time and annoyance of re-setting the head angle every time the ram is transversed. The head swivels on a flange on the end of the ram. The ram has a large key sliding in a keyway fitted with an adjustable tapered gib. The head is always in perfect angular alignment—there's never any side play or canting when ram is moved.



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0.04 mg.

0.45 mg.

0.075 mg

0.5 mg.

0.1 mg.

0.5 mg

2 mg.

3 mg.

Phosphorus

Manganese

Potassium

Magnesium

Malybdenum

Cobalt

Copper

lodine

Zine

We invite you to compare the richness of this formula

with any other vitamin and mineral preparation.

Vitamin D

Vitamin C

Vitamin B1

Vitamin B2

Vitamin Ba

Vitamin B<sub>12</sub> Niacin Amide

1,000 USP Units

75 mg.

2.5 mg

0.5 mg.

1 mcg.

40 mg.

5 mg.

ALWAYS felt simply "run down." People were thinking of me as a "spoil-sport." I didn't know why until my doctor put me wise. He told me that I acted like a man much older than myself ... and explained why I felt "tired" ... why my youthful vigor was slipping away . . . why my wife and family were beginning to think of me as a worn-out man.

He told me how a vitamin-mineral deficiency in my diet could bring on these symptoms-rob me of the joys of living ... and suggested that I supplement my diet with pep-building vitamins and min-erals. Thousands of others had found new energy and new youth by adding these essential factors to their diet.

Well, I put off doing anything about my condition

# 30 DAYS HIGH PO

# LIPOTROPIC FACTORS,

Safe Nutritional Formula Containii Methionine, 11 Vitamins (Including Blod

To prove to you the remarkable advantages of the Vitasafe Plan . . . we will send you, without charge, a 30-day free supply of high-potency VITASAFE C. F. CAPSULES so you can discover for yourself how much healthier, happier and peppier you may feel after a few days' trial. Just one of these capsules each day supplies your body with over twice the minimum adult daily requirement of Vitamins A, C and D-five times the minimum adult daily requirement of Vitamin B-1 and the full concentration recommended by the National Research Council for the other four important vitamins! Each capsule also contains the amazing Vitamin B-12, one of the most remarkably potent nutrients known to science.

### HOW THE VITASAFE PLAN OPERATES TO SAVE YOU MONEY

When you receive your free 30-day supply of vitamins, you are under no obligation to buy anything. With your vitamins you will also receive a handy postcard. If after taking your free Vitasafe capsules for three weeks you are not satisfied in every way, simply return the postcard and that will end the matter. Otherwise, it's up to us -you don't have to do a thingand we will see that you get your monthly supplies of vitamins on time for as long as you wish, at the low, money-saving price of only \$2.78 per month.

## POTENCY AND PURITY GUAL

As you probably know, Government strictly each vitamin manufactu requires the exact quar each vitamin and miner clearly stated on the lab means that when you use SAFE C. F. CAPSULES be sure you're getting p gredients whose beneficia have been proven tin again!

### AMAZING NEW PLAN S VITAMIN PRICES ALMOST

With your free vitam! will also receive comple tails regarding the ben an amazing new plan th vides you regularly with vitamins and minerals y need. This Plan actually you to receive a 30-day su vitamins every month re safely and factory fresh actly \$2.78-or 45% lowe the usual retail price. BU DO NOT HAVE TO I NOW-you are under no tion to buy anything f whatsoever. To get your day supply and learn al the benefits of this amazi Plan, be sure to send th card now!

# O 1957 VITASAFE C

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